The Chemical Age

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NOTICES:—All communications relating to editorial matters should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Some After-Thoughts

THE Annual Meeting is over, and everyone is agreed it was one of the best, if not quite the best, of the whole series. It may be said to have resulted in two rediscoveries—or at least in a quickened consciousness of two things. The first is the rediscovery of the inherent importance of the chemical industry, of the need of its yet more complete organisation, and especially of the advantage of a closer alliance between the purely scientific and the industrial sides of what is essentially one interest. The internal consciousness of the importance of the industry is one of the many side effects of the war. Under the call of national necessity chemistry has emerged from the obscurity of the laboratory as one of the most vital national interests, and the chemist, more than ever before, has been made to feel the importance of his calling. And with this feeling has come a greater sense of the need of cohesion and co-operative effort. Already much has been done through the Society of Chemical Industry to unify the chemical interests of the nation, and to weld the members of the profession, whether their vocation lies in the pure or in the applied field, into a community united in aim and effort, and able to bring its combined influence to bear with effect where common action is required. The work, however, is not yet complete. The foundations need to be consolidated, and the membership made far more representative, before the influence of the industry will fully correspond to its numbers and its importance. And not the least good result of this year's Annual Meeting is the emphasis it has thrown on the need of loyalty and co-operation among all the industrial units of the profession.

Beyond this, as Professor Louis truly remarked to us on Friday, this year's Annual Meeting has left a sensible effect on public opinion. Many of the problems discussed opened one's eyes to the fact that the chemical profession is no mere exclusive or esoteric community, obsessed by its own concerns; neither troubling about opinion outside nor inviting public attention to its own proceedings. The papers read—that of Dr. Herbert Levenstein, for example—do, indeed, deeply interest chemists, but beyond this they represent national interests of the widest character. The work of our chemists in the matter of dye production alone is vital to the great textile industry of this nation, and the Society which represents such workers cannot afford to live to itself alone. It must indeed serve most immediately the needs of its own members, for that is its first motive and justification; but if its vision is restricted to this alone, it only half sees its place in the national life. The nation, as represented in the Press, has this year recognised the public services which chemistry has rendered to it, and those it must yet render to our national industries in the future. And the Chemical Society will serve itself not less efficiently by keeping before it the services due from so important and distinctive a community to the whole commonwealth. That way, much more than in any introspective attitude, lies its development in the future. For it is as true of communities as of men that they are greatest who are the servants of all.

The Pooling of Knowledge

MOST of the discussions were concerned with the material problems of business development, and the part the chemist is to play in it. It was, however, good to meet now and again with a different note, suggesting the scholar rather than the shop-keeper. More than one speaker put in a fine plea against a too sordid exploitation of science in the cause of commercialism. As usual, the case of Germany was cited. Professor Armstrong pointed out with great force that the laboratories of Germany had been spoilt as educational institutions by the policy of trying to turn chemistry into a money-making business. His view was—and it is very well worth pondering over—that, while Germany had gone up in the technical and commercial scale, she had steadily

deteriorated from the scientific point of view. In his day at Leipzig from twenty to thirty students would be at work on a common theme, and each of them knew what the others were doing. Later such studies became subsidised by the manufacturer, and instead of the students being free to exchange and compare results they worked under a pledge of secrecy. One can see at once what Professor Armstrong rightly described as the sterilising influence of such a system, which for a sectional and immediate gain pays the penalty of an ultimate loss to science.

We heartily welcome this plea for the recognition of the spirit in which the search for truth can alone be successfully conducted. The evil which Professor Armstrong deplored is at last coming to be recognised, both here and in America. Both over there and in this country there have been protests of late against the policy of isolating knowledge and scientific results for the benefit of this or that particular interest, instead of treating them as at the service of mankind. It is a violation of the best traditions of the laboratory or the class-room to withhold the results which patient research has brought to light. Such results are a common heritage, and it is against all the laws and canons of intellectual or scientific progress to confine them to privileged channels. One of the most hopeful recent signs is the spirit of protest against this exclusive exploitation of hard-won secrets, and the demand for the pooling of knowledge in the interest of human progress, and we are glad to see this spirit so well represented in the course of last week's discussions. The way of advance lies not in each one fighting for his own hand, but in all working for the common good.

The Inter-Allied Movement

One of the most interesting movements that came up for consideration was that for the federation of Inter-Allied chemical interests—a chemical league of nations, as the *Times* picturesquely put it. It may be worth recalling that this is not a post-war development begun as a punitive measure against Germany. The movement began before there was, on our side at least, any thought of war, and if for the present a nation so successful in chemical applications as Germany was is excluded, it is the inevitable penalty of her own action. The task of organising the chemists of nations, differing in language and so many other points, is not easy, but it is being successfully overcome, and the conferences of last week marked a distinct step forward. There is, perhaps, some slight danger that too much preliminary effort is being expended on organisation alone. Instead of waiting for a complete organisation before starting work, it is sometimes preferable to begin work with such organisation as is available, and as the work proceeds the organisation grows almost unconsciously with it. Perhaps the most useful starting point in this case would be an attempt to provide the chemists of the federated Allied nations with the type of literature which Germany produced very successfully before the war.

As M. Paul Kestner remarked, however, in the course of some conversation on the subject, the immediate need for this or any other class of work that may be undertaken is funds. The matter is of such pressing importance that a grant-in-aid might very well be asked for on purely educational grounds. The debt which the country owes to chemistry is beyond all doubt, and the Government would be but slightly acknowledging it by a grant, say, of £10,000 towards the preliminary cost of setting the Inter-Allied movement on its feet. Such a grant would about equal the salaries of some dozen more or less useless undemobilised officials, and if we can afford to pay unemployment grants on the rather lavish scale adopted, it ought not to be difficult to spare so comparatively trifling a sum for this really important cause. We see no reason why our own Government, and indeed the Governments of the Allied nations, should not be approached without delay, and strong representations made in support of grants-in-aid. If France, Italy, and Belgium should find it difficult to vote any money for the purpose, it ought to be possible to squeeze something out of the British Treasury, and certainly Washington would find it hard to deny the claim on the ground of financial stress.

Two Presidents

In taking leave for the moment of this year's Annual Meeting, it would be ungrateful to leave unsaid a word about the retiring and incoming presidents. Professor Henry Louis had presided over the Society of Chemical Industry during the two most fateful years in our history, and the creditable part the Society has played is due in no small measure to his wise and strong guidance. Combining, as not many men do, the qualities of the man of science with those of the man of affairs, he has been exceptionally well fitted for the post. His repute as a chemist has given him an influence far beyond the limits of his own country; his wide experience of commercial and industrial chemistry has qualified him to deal with practical business matters; and his tact and courtesy, together with his unselfish and strenuous service, have won the respect and affection of all who have been privileged to work under him. Professor Louis may look back upon two years of eminently successful work for the Society and for chemical interests in the wider sense, and his colleagues will recall with pleasure the good work and the pleasant relations which have distinguished his period of office.

In Mr. John Gray, Professor Louis will have a worthy successor. His life has been spent in the chemical industry. The business capacity which is now recognised in his election to the presidential chair will find ample scope in the practical problems which confront the Society, and his engaging personal qualities will carry on the traditions associated with the chair. Mr. Gray modestly recognises himself as in a large degree the mouthpiece and the instrument of his council, but in the moulding of the Society's policy we may expect from him a strong, if unobtrusive, influence. His hope, we believe, is to see the work already done consolidated and steadily developed, and it will be a surprise if, when his term of office comes to an end, these aims will not have been largely furthered under his guidance.

The Coal Problem

The problem of coal supplies, already sufficiently serious from the latest advance of 6s. per ton, has become much more acute as the result of the developments in

Yorkshire. The news at the moment of writing is that six collieries are already flooded, and that several others are in immediate danger. In addition, it is feared that the stoppage of the ventilating machinery may result in an accumulation of gas. The effect on industry has been immediate. Some works are already shut down, and if the present deadlock continues the number must speedily increase. Since coal is the very basis of our national industries, the attitude of the miners, in the face of the urgent need of re-establishing our trade on a peace basis, looks rather like madness. According to the leaders the issue is the nationalisation of the mines. It is safe to say that to the majority of the actual coal-getters nationalisation is nothing more than a term, which, however, they have been taught to believe means justice and vastly improved conditions. The idea that nationalisation is to bring this expected paradise to the working miner is an illusion; it can affect him only to a fractional extent, and, as regards output, we doubt if it would have much effect either way. Yet on this largely academical question, whether the miner's wages reach him through a Government official or through the private company's cashier, the whole of our municipal and public industries are threatened with stoppage and dislocation, at the very stage when the co-operative reconstruction of our trade is the supreme national need. The prospect is appalling.

If we turn from this troubled outlook in our own country to the position abroad, there is little comfort to be drawn from the comparison. All the accounts from Germany speak of an eager desire to restart trade and begin the recovery of their lost position. The reports give, no doubt, the most favourable side of the picture, and reveal none of the internal troubles which Germany is assuredly undergoing. Still they can hardly be ignored. The American position, as compared with our own, is still more ominous for us. Enriched by their enormous trade in the early stage of the war, and taking a natural advantage of the opportunities provided by the pre-occupation of other nations on war work, the industries of the United States are already in an especially strong position, and this coal problem is an additional and a disastrous handicap upon our own efforts at making up lost ground. According to Mr. Milne Watson, gas is used in 2,000 different trades, and the effect of the last advance will be an additional financial tax on both home and exporting industries, as well as on the private family. According to another authority, Philadelphia coal can be delivered at Chelsea at 42s. a ton, while Scottish sea-borne coal costs over 50s. per ton as against a pre-war price of 13s. If America can send over coal which is saleable here at lower prices than the products of our own pits, the prospect is serious enough. When to this is added the deliberate action of the miners or their leaders in letting the mines become flooded, and permanently damaged to a degree that cannot be at present estimated, one can only think that the men—in some ways the finest type of workers we have, who have done splendid work in the war—have temporarily lost their reason. If the position could only be put to them, as our need was put to them during the war, our belief is that they would readily respond to the sense of national duty. The difficulty is that their thinking is done by proxy to such a large extent, and that they allow themselves to be deceived by the chimerical visions of prosperity which are so skilfully exhibited as bait.

New Issues

One of the most marked signs of the gradual restoration of ordinary trade conditions is the new flotation of new companies, and the issue of additional capital by existing companies. This week the British Dyestuffs Corporation, Ltd., are offering for subscription 2,500,000 Preference and 2,500,000 Preferred Ordinary shares of £1 each at par. The Government have subscribed for 850,000 Preference and 850,000 Preferred Ordinary shares, while 756,481 Preference, 727,281 Preferred Ordinary, and 980,044 Deferred shares are issued to the vendors. The Government have given their approval, the company has been formed by arrangement with the Board of Trade to concentrate, extend, and expedite the manufacture of synthetic dyestuffs and colours in this country. In furtherance of this object about 97 per cent. of the shares of British Dyes (Limited) and Levinstein (Limited) has already been purchased. The United Glass Bottle Manufacturers, Ltd., also are offering £100,000 Ordinary shares of £1 each at 21s. per share, and £75,000 Five per cent. First Mortgage Debenture stock at £95 per cent. The company, which was formed in 1913, is an amalgamation of six of the leading glass bottle manufacturers in the United Kingdom, and the estimated production of the various works at the present time is 150,000,000 bottles per annum. It is also interested in the development of the Libbey-Owens Sheet Glass process. Offers are now invited for 1,000,000 Seven per cent. C Cumulative Preference shares of £1 each of Van Den Berghs (Limited), at 21s. per share. The company was formed in 1895 to take over the businesses of Messrs. Van Den Berghs Bros., of London, and their associated businesses abroad. Since that date the company has considerably developed its trade, both here and abroad, not only in connection with the sale of margarine, but also in the establishment of factories for the manufacture and refining of edible oils, as well as the production and sale of condensed milk. In addition there is a factory for the manufacture and sale of soap.

In addition to these and other new issues, several important amalgamations are announced, indicating a growing tendency to combine forces so as to diminish competition, reduce working and administration expenses, and enlarge and cheapen production.

Ramsay Memorial Fund

It is obvious from Dr. Seton's statement that a considerable amount of work yet needs to be done to ensure success. Individual subscriptions have come in well, and firms of manufacturers have contributed a considerable sum, Messrs. Brunner Mond & Co. heading the list with £5,000, the only four figure item by the way in this section. The two main sources of further revenue would appear to be a Treasury grant which might well be made to a scheme for providing the educational and industrial efficiency of the nation, and an organised effort by the chemical industry as a whole. The oil industries have set a fine example in their endowment of the Cambridge Chemistry School, and the chemical industry may, perhaps, be induced to do something in this case worthy both of itself and of the great chemist whose work is to be commemorated.

Society of Chemical Industry

Notes and Concluding Reports of the Annual Meeting in London

THIS year's annual meeting of the Society of Chemical Industry could hardly have ended more pleasantly than with the visit to Windsor Castle and the excursion on the river which occupied the whole of Friday. It was a day of recreation after a rather strenuous week, and the delegates with their lady guests, numbering nearly 200, were in a mood to enjoy the change. Most of the leading figures at the conference were present—Professor Henry Louis, the retiring president, and Mr. John Gray, the incoming president, Dr. Charles Keane, Dr. Stephen Miall, Dr. Hodgkinson, Captain Goodwin, Dr. Tripp (review editor of the *Journal*), Dr. Paul Kestner and his French and Belgian associates, and many others. The morning was spent in an inspection of the castle, and after luncheon at the White Hart Hotel, the party embarked on two steamers for a sail up the river and back to Taplow. The weather was perfect, and the riverside houses and gardens, undergoing the last touches of decoration for the Peace Day celebrations, made a series of charming pictures as the party sailed past.

Business was severely eliminated from the day's programme, but at the luncheon one necessary exchange of courtesies had to be permitted. Before separating, Professor Louis, on behalf of the delegates to the annual meeting, expressed their indebtedness to the officials of the London Section for the admirable arrangements made for the conferences and for the entertainment of the delegates during their stay in London. Everything had gone through perfectly. The papers and discussions had been excellent, and the best compliment he could pay to the organisation was to say that it had worked without making themselves conscious of its existence. Dr. Charles Keane, the president of the London Section, acknowledged the toast, and bore testimony to the enthusiasm with which everyone had worked for the success of the meeting. In this connection the services of Dr. Stephen Miall were present in most minds, but the spirit in which they were rendered is perhaps best recognised by taking them for granted. During the proceedings the following interesting letter was read on behalf of the King :—

Buckingham Palace, July 17, 1919.

DEAR SIR,—I regret the delay in answering your letter of the 12th instant, in which you suggest that the King should send a message on the occasion of the meeting of the Inter-Allied Federal Council of Chemistry. As, however, it is understood that the British Scientific Products Exhibition is connected with your Society and as His Majesty has expressed a hope that it may be possible to visit the Exhibition, I hope your Council will regard this as an indication of the King's interest in and appreciation of the work of the Society of Chemical Industry of which His Majesty is patron.—Yours very faithfully,

Stephen Miall, Esq. (Sgd.) STAMFORDHAM.

Naturally, in the course of the day's intercourse, the conversation turned largely on the character of the week's conferences, and everywhere the opinion prevailed that the annual meeting of this year had been the most successful and indeed the most influential in the whole series. Professor Henry Louis, whose excellent work during the past year is warmly recognised, felt that beyond the success of the particular conferences, the general effect had been to make the chemical industry sensible of the great part it had played in winning the war, and more conscious of its corporate place among the industries of the nation. More than this, he pointed out (alluding to the notices the meeting had received from the Press) the nation had apparently begun to appreciate the fact that there was such a thing as the chemical industry in existence, and to recognise that the aid of the trained chemist was vital to the success of our principal industries. Professor Louis warmly welcomed this public recognition, and his view appeared to be that the Society had everything to gain and nothing to lose from the making of its important work better known to the nation. Mr. John Gray was no less emphatic about the success of this year's meeting, and about the need of consolidating the work already done and vigorously extending and developing it in the future.

The spirit of content with the week's proceedings was nowhere more complete than among the foreign delegates. M. Kestner, when asked what they thought of their visit, summed it up in one remark: "Charmed; all simply charmed." And indeed it was easy to see they were from the gaiety of their spirits. Most of them left during the week-end for the meetings of the International Research Council in Brussels, at which the British representatives were Sir W. J. Pope and Dr. E. F. Armstrong. M. Kestner is, of course, very much interested in the inter-allied movement and gratified at the progress it has made. His only concern is as to the size of the movement. He realizes that the federation has in it immense potentialities, and that if they are to be realized a great deal of work and organisation will be necessary. In addition, there is the inevitable problem of finance. It requires funds for organisation and development, and the resources are at present rather slender. He feels, however, that, with wise direction and loyal co-operation, these difficulties will gradually be overcome, and the co-operation and consolidation of the chemical interests of the allied nations will be turned into an effective instrument for the good of chemical science, which must mean ultimately the good of chemical industry. M. Kestner was warm in his praise of the welcome the foreign delegates had received and of the excellent spirit which marked the various conferences and social functions.

The Conference on Dye-stuffs

The Position and Needs of a New British Industry

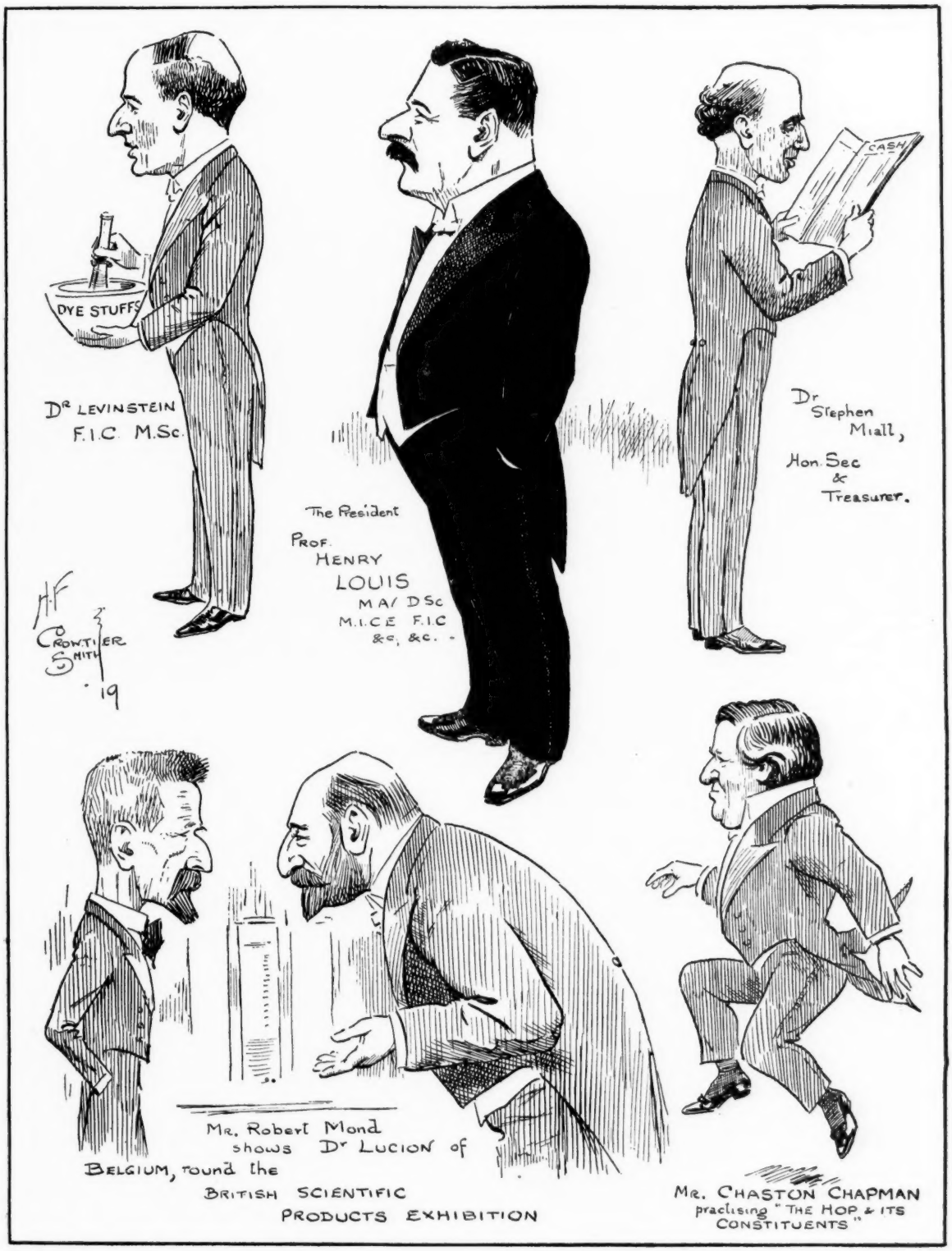
On Thursday, July 17, at the Salters' Hall, a conference was held on "Dye-stuffs, Synthetic Drugs, and Associated Products." Dr. REE, in the absence of Lord Moulton, took the chair.

Progress in British Dye-stuffs Industry

Dr. HERBERT LEVINSTEIN, in the course of a paper on this subject, said he proposed to deal with those aspects of the dye industry which explained why any British Government might well feel uneasy until this country possessed a dye industry equivalent to that of Germany. There were four reasons why the success of the dye industry was vital to the State :—(1) It was a key industry. (2) It was required for national defence as a guarantee of peace. In this connection Dr. Levinstein dealt with the war record of the German Trust, known as the I.G. It was entirely owing to that combine that Germany had been able, in spite of the blockade, to carry on the war after the end of 1915. But for the position of her dye industry

Notabilities at the Annual Meeting

(Sketches by H. F. Crowther Smith)



the German resistance would have broken down after a little more than a year for lack of nitric acid. Could anything more clearly prove the value of the German dye industry and the loss and destruction which it caused us? He was not defending the building up of this country's dye industry for the purpose of making toxic acids, but if Germany retained her monopoly in dye-stuffs she possessed a monopoly in the rapid production of toxic acids, and in that event the world was not a safe place for peaceful people.

The third reason was the question of organised research, and its relation to the introduction of new industries. Very few people realised to what a small extent new industries arising out of new inventions had been created in England in recent years in comparison with those created abroad, particularly in Germany. We were apt to regard our commercial supremacy as being based on a few staple industries, such as the cotton industry but it was the nation which produced the most and best inventions, other things being equal, which would ultimately predominate in the commercial struggle in the world. At present only a few inventions came from this island, the reason being that industrial inventions were, as a rule, not the result of a flash of intuition, but of patient and skilled research carried out with big resources on a well-considered plan. On the whole, that country which produced the most chemical inventions had the greatest number of trained research chemists. The fourth reason was the political importance of the dye-stuff industry.

These four reasons might be summed up in the following propositions:—

(1) It would be madness after the close of this terrible war, fought to secure our ideals of political freedom, not to make ourselves economically free from Germany.

(2) It would be folly to leave Germany the sole possessor of factories, potential arsenals, which, because they were unique in the great war, had enabled her to carry on the war for three additional dreadful years.

(3) It was impossible for us to maintain our commercial supremacy if we threw away the one chance of organising the inventive talents of our chemists. If Germany retained her predominance in Europe in the dye industry, she would ultimately win the war, for though the campaign was gloriously ended, the war was not over, nor the victory certain. Though the German military defeat was complete, she might yet regain through her dye industry her former ascendancy over Europe. Germany recognised that fact, and was straining every nerve, using every device, to re-establish her commercial dominance in the dye industry. An enormous responsibility rested upon the chemists of this country. In the final stage of the struggle in which the clash of arms had been but the first round, the chemists would be a decisive factor.

The CHAIRMAN said he would use his best influences to have the Paper reprinted beyond the mere issue of the *Journal*, so that a still wider circle of people might have the advantage of reading what he thought was a paper of very great national importance indeed.

Dye-stuffs and British Textiles

Mr. JAMES MORTON, governing director of Morton Sundour Fabrics, Ltd., and chairman of Scottish Dyes, Ltd., in a paper on this subject, dealt with it from the standpoint of a maker and user of dyes for textiles. The outbreak of war, he said, found users of dyes practically stranded for want of colour, and although much had been done to meet the sudden crisis that arose, the coming of peace found dye-makers with their house only half-built, and forced to admit that they had not yet reached the point when dye-making in this country could, even approximately, meet the national requirements. What were they to do with those hundreds of tons of German colours that would soon be knocking at our gates for admission? Pre-war resolutions to use no more colour from Germany were being tempered, and the Government, in spite of its desire to foster the making of dyes, could not ignore the urgency of maintaining our export trade in textiles. The war-fervour attitude of having no dealings with Germany after the war was already broken down. The Allies were even now tumbling over each other in Cologne and elsewhere to effect sales of their wares—French, American, and British alike—and it was only folly to think the trading can be on one side only.

There were three separate interests to be satisfied:—(1) The maintenance of our supremacy in the textile trade; (2) the establishment of dye-making in this country as a sound commercial industry; and (3) the guarantee of national security. Although himself a free-trader and all in favour of the open door in normal conditions, to open our markets freely to German products now would be an obvious breach of faith with those firms who had invested large sums to supply the nation's needs. On the other hand, it would be equally disastrous to raise indiscriminate tariffs. A third method remained of establishing a temporary control over the imports of dyes into this country and a special kind of subsidy by the Government to meet the probationary period. There had been much discussion as to what should be the probationary period. The term of 10 years given by the Board of Trade seemed a reasonable calculation.

Dye-making in this country, given time and opportunity, could be put on a sound and profitable basis. Given this and a reasonable amount of understanding and co-operation among the dye-makers here, he saw no reason why a few years should not see us abreast of the best that the Germans are doing; and then he would be the last to ask for any sort of favour or protection for the industry. It was in the meantime important that the Government should try to make available for ordinary sale the intermediates that form the basis of so much of the potential colour production.

Colour-producing Intermediates

Professor G. T. MORGAN gave a summary of work carried out at the Finsbury Technical College during the past three years on certain colour-producing intermediates which, he said, illustrated the well-worn theme which should not be forgotten even in the midst of international peace, namely, the close relationship between synthetic dyes and military explosives.

Discussion

Dr. FORSTER in opening the discussion on these papers, said, it seemed to him that Dr. Levinstein's address should be circulated among as many people as possible, not only among the general public, but also among chemists; because he recognised in Dr. Levinstein's address an antidote to a very dangerous poison, which crept through the remarks of everybody who discussed the question at the present time, namely unjustifiable optimism. Most ridiculous statements were being made as regards the comparative efficiency of British chemists and German chemists, and the same remarks were being made in regard to American chemists. He had read only a few weeks ago, a remark made by a recognised chemist in America, to the effect that American chemists in four years had accomplished what German chemists had done in twenty years. That was absolute nonsense of the most dangerous character, because it was so misleading. What American chemists had done in four years had been successfully to repeat in the laboratory and the factory experiments on a small and large scale which had taken German chemists twenty years to elaborate *de novo*, which was an absolutely different thing. It was because people were so constantly being told such absurd things that he welcomed among other reasons, the very admirable, sane, and critical address which Dr. Levinstein had given. The thing which had impressed him most was that Dr. Levinstein had not been carried away, in spite of his extraordinary personal achievements during the war, by that absurd optimism which had infected so many people.

Professor PERKIN remarked, that what he was particularly interested in was the question of the co-operation of the universities and the industries. He had long looked at the matter from the point of view that what were required in an industry like the dye industry, were the best possible chemists obtainable, and men of the greatest possible ability. Those men had to be trained in the university and in the better-class technical schools; the best scientific ability was, or should be, concentrated in the universities. What he had been pleading for for so many years was that the industry should make use of those scientific brains which were concentrated in the universities. In connection with the dye industry there were some universities which had little colonies of men working at problems connected with that industry, and he ventured to think, although the thing was more or less in its infancy, an amount of ground had been covered which was sufficiently encouraging to raise the hope that all the manufacturers would see that the universities were largely used in order to solve the problems which confronted them.

Mr. CARR said, the important point for them as chemists to remember, was that it was of paramount, fundamental, and essential importance that Britain should be the home of chemistry, and she could not be the home of chemistry unless she was the home of industrial chemistry. The universities would not be able to maintain that large number of professors and dons, and research chemists, which would be necessary if England was to be the home of chemistry, unless industry was flourishing and making such large profits as would enable them to treat the universities generously.

Mr. MORTON said, there was one point he would like to emphasise in regard to Dr. Levinstein's paper, namely, that the importance of having an army of chemists in this country for the dye industry was

the stimulus it gave to general venture. That was a very important point in the establishment of the dye industry. It was not only the dye industry that was going to benefit, but the effect would be to quicken the whole of the intellect of the country, and to encourage people to branch out into industries other than the dye industry. A chemist in his investigations discovered things quite outside his own sphere, and the very fact that there was a new army of men rising up was bound to result in enormous new developments quite outside the dye industry. By raising the dye industry we were quickening the national intellect, and helping enormously the opening up of other avenues of commerce.

Dr. LEVINSTEIN said, if this country was to make a great success of its dye industry, it would only be owing to the fact that all the chemists of the country supported and helped it. There had been a great change in the outlook of the universities, in that they were not holding themselves so much aloof from the industry as they had in the past. The universities had done great work during the war, and he looked forward to receiving great support from them, primarily of course by supplying the dye industry with its raw material in the shape of well-trained chemists.

The Chairman Reviews the Discussion

The CHAIRMAN said, that with regard to the dyestuff industry during the war, the members must recognise that the points which Dr. Levinstein had made were a collection of all the most serious considerations that ought not to be forgotten in the future. Dr. Levinsten had been extremely courageous in stating the facts of the situation, and the chemists of the country ought to be very grateful to him for doing so. With regard to Mr. Morton's paper, he felt a very great admiration for the scheme which Mr. Morton had drawn up, as to how the problems which were going to arise in respect to dye-stuffs should be dealt with. Very difficult problems indeed had to be faced, and anybody who contributed his considered opinion to the question was doing a great public service. The main point was that in such matters an entirely new problem had to be dealt with; there were no precedents to work upon. The movement had to be a slow one, and while it was quite conceivable that something of the kind Mr. Morton had suggested might be ultimately adopted, he wished to call attention to the fact that there were several points which would make it rather difficult to adopt the whole of Mr. Morton's proposals.

One important thing which had to be faced in the future was the competition which would undoubtedly come from abroad. The Germans in the future undoubtedly would come to this country and make proposals to dye-users here, of a character very similar to those they made before the war. They would say: "Now, there are certain dyes which you are not making in this country. We can produce those dyes, and we will let you have them at relatively low figures if you will be prepared to include in the contract for those dyes other colours which are being made here." That was one of the ways in which the Germans would probably try to defeat such a proposal as Mr. Morton had made. Mr. Morton had said that a great deal had been done during the war which he felt might have been avoided in the way of unnecessary duplication of production and of research. He agreed, but he was afraid that during war time that kind of thing was almost inevitable, because there had been a great shortage of a number of products, intermediates particularly, and if people had found that they could not get them from one firm they immediately went to another, and thus quite a number of firms started making intermediates in order to supply the absolute needs of their customers. It was not only a question of that kind, but also the fact that some makers would actually be making a certain intermediate, the quality of which was not sufficiently good for the purposes of the dye maker. Unless one worked with very pure materials, the dyes produced were very often not of the shade needed. They were very often of the quality required, but in other respects were not satisfactory. So that, again, led to an unnecessary duplication of plant and production.

It was possible for the Government, perhaps, to deal with a situation of that kind, but he was very doubtful indeed, whether the Government could really do very much in the way of preventing the particular abuse to which Mr. Morton had called attention. He did think that in that way private effort would have to take a leading part.

When the Association of British Chemical Manufacturers was formed, about three years ago, one of their principal objects was to get the chemical manufacturers of this country together in one body, in order to discuss problems which interested them, and also to prevent unnecessary duplication of plant and research. In the past, British chemical manufacturers had been super-individualists, and very little had been done by them to effect jointly something which would really be for the benefit of the country as a whole. There had been far too much internal competition in this country, instead of showing a united front to the German manufacturers. Although the Association of Chemical Manufacturers had not accomplished anything like what they hoped they would do, they had done something, at all events in that direction, and he had great confidence that a great deal more could be done in the future in the way of preventing the kind of thing of which Mr. Morton complained.

Import of Foreign Dye-stuffs

A good many of the points on which Mr. Morton had touched had been of great interest to himself, because he had to deal with the question of the permission for the introduction of dye-stuffs into this country. It was a very arduous, and in some respects a very disagreeable task. As a matter of fact he represented the interests of the chemical manufacturers, and the dye-makers of the country other than the British Dye-stuff Corporation; but he had made it very plain before he had agreed finally to act in that capacity that he would not be willing to consider purely the interests of the manufacturer, because he realised that while undoubtedly the making of dye-stuffs, and the intermediates necessary for their production was a very important factor, the interests of the dye-user were if anything greater, because the dye-user represented a very much larger number of people, and the trade that this country did in respect of dyed materials represented a very much larger turnover than the mere production of dyes. He said that, not by any means forgetting what Dr. Levinstein and others had called attention to, namely, that independently of that the dye-making industry was of such tremendous value from the point of view of national defence. In regard to the work which was being done by the Licensing Committee, it was so new, and there were so many problems to face, that it was not at all an easy task; but when he found himself worried at all he always asked himself the question: "What in the best interests of the country should be done?" and he thought the members would agree that it was the only way in which a proposition of that kind could be dealt with. He thought, before very long—perhaps it would take some months—ways and means would be devised to overcome some of the serious difficulties to which Mr. Morton had called attention, and which were almost sure to arise. He was certain there would be a good deal of adverse criticism, but he did hope there would be a certain degree of patience exercised by those who took an interest in the matter, and that it would be possible in that way to avoid a very difficult situation.

Inadequate Supply of Chemists

There was only one other point to which he desired to allude, namely the question of chemists. Although there was no doubt at all that some of the finest and most brilliant inventions had been made by British chemists, and that the work they had done was as good as, and in many ways superior to that which the best German chemists had accomplished in the past, there was one very serious difficulty. It was that they had not had in the past a sufficient number of chemists to draw upon who could carry out their brilliant ideas. He thought the situation was going to improve vastly during the next few years. He understood from all the universities and higher technical institutions of the country, that there was an enormous rush of students, and that before very long that particular difficulty would be overcome. He thought it was also of considerable interest to bear in mind the fact that some of the biggest discoveries which the German colour makers had made during the last twenty or thirty years, had been made by chemists who were not of Teutonic origin, but who were Alsatians, Poles, Italians, Swiss, and others; a fact which ought not to be forgotten, and which he thought of great importance in the situation.

The Manufacture of Intermediates

At the Afternoon Session the Chair was taken by Dr. Ree.

Mr. E. V. Evans, M.B.E., Chief Chemist of the South Metropolitan Gas Co., read a paper on "The Manufacture of Intermediates."

Mr. Evans said that intermediates are not only manufactured by the British Dyes Corporation, but also by a number of other chemical undertakings, and during the last three years the author had had the opportunity of meeting at regular intervals practically all these manufacturers. They constitute a special group of the Association of British Chemical Manufacturers and may be said to represent all British makers of coal tar intermediates and dyes outside the British Dyes Corporation. When considered individually most of these undertakings are small compared with the British Dyes Corporation, but in the aggregate they represent an invested capital of some £25,000,000, and, if their efforts were co-ordinated, would form a body admirably suited to deal with the problems of the future. With so many industrial problems remaining unsolved the value of such a body could not be ignored, and although the effort already made by the established dye manufacturers was stupendous and most praiseworthy, the national interests would best be served by utilising to the fullest extent the whole of the resources of the chemical industry.

One did not see in Germany twenty firms making salicylic acid or *B*-naphthol each with an output of 10 cwt. per week. Mass production was the order of the day, and in this lay a great measure of the success that had been attained. The capacity of the *B*-naphthol plant at Meister Lucius und Brüning Höchst, was eight tons per day. The process had naturally been developed to a high state of efficiency, yet there existed nothing but that which results from a careful study of the process in the laboratory and equally careful production of it on

the large scale The efficiency of the process *qua* process did not appear to exceed that of certain installations operated in this country, but each item of manufacture had been carefully and elaborately studied with the object of producing at a minimum cost a product of the highest degree of purity. Whilst the organisation of the German chemical industry allowed a certain amount of healthy competition to exist, the wholly inefficient manufacturer had to be prepared to alter his methods or pay the penalty of inefficiency. This penalty was not the bolstering up of one process by a highly remunerative one, or the utilisation of existing fighting funds or Government moneys but rather the closing down of the plant.

In the manufacture of the intermediates still required in this country processes of a certain degree of complexity were entailed. Moreover, of these intermediates many were required in small quantity. It was therefore impossible to imagine that the manufacture of these new intermediates when conducted in a number of small units distributed throughout the Kingdom would lead to success. In such cases, in order to pay due regard to the importance of mass production, manufacture must be undertaken only by one or two makers possessing special facilities, for it was no simple matter to displace imported manufactures at the present moment, even with installations of large output, owing to the existing cost of plant and apparatus and the high prices of labour and fuel. Whilst one manufacturer was admirably equipped for the production of phenol cresols. &c., others were more fitted for the production of chlorine derivatives, whilst in those centres where there existed an adequate supply of coal tar products and a sufficiency of inorganic products such as sulphuric acid, ammonia, and its congener, nitric acid, other special facilities were possessed.

A great co-ordination of effort was required and the industry sought leadership. Chemical manufacturers had had four years of government control and would welcome internal control in the industry.

Discussion

The CHAIRMAN said that the members of the Conference had heard a very interesting paper by Mr. Evans, who had had exceptional opportunities within the last month or so of realising the conditions which obtained abroad in the large colour factories.

Professor GREEN said that Mr. Evans argued for a complete separation, or anything like a separation, of the manufacture of intermediates from the manufacture of dyestuffs; he did not agree with him at all. He thought that the author left out of account many factors, especially the factor of the close inter-relationship of by-products, and he did not think that it was possible to divorce dyestuff manufacture from the manufacture of its intermediates. Of course there were some intermediates which were used in comparatively small quantities, which no one would dream of manufacturing if he could buy them from somebody who made a speciality of them. In such cases separate manufacture might be an advantage. Such things as betanaphthol, and some of the things which Mr. Evans specifically mentioned, which were not small things but very big things, should essentially be made by the dye manufacturer himself.

Mr. F. H. CARR said that anyone who visited that wonderful centre of distribution, the Rhine, saw the enormous advantages which the chemical industry in Germany had, because the Rhine brought each unit concerned into immediate proximity to the other units, even though the units might be thirty or forty miles apart. In England it was desirable to consolidate the heavy chemical industries round the best equivalent which this country had, namely, the Mersey and the Ship Canal.

Mr. ARTHUR GREEN said that he had had the opportunity of being with Mr. Evans during his recent visit to the German chemical factories, and he must say, with regard to one debatable question which had arisen, namely, the question of the desirability of manufacturing intermediates, that he did not think that he would claim that in all cases intermediates should be made by a separate manufacturer from the dye manufacturer. He could not go so far as the author seemed to indicate, because, after all, as to the great works in Germany, one of the secrets of their success was not their geographical position but the fact that they manufactured all those things for themselves. The whole of the processes were carried through, practically speaking, at one centre. If the manufacture of intermediates was to be distributed over the whole of the United Kingdom, it would mean that they would be made in places where their manufacture would be more expensive than it would be if they were made in the place where the dyestuff maker had established himself. In addition, there would be the cost of transferring the intermediates to the dye manufacturer, and there would have to be set up by the dye manufacturer a system of control and checking the things supplied to him by the man making the intermediates. In Germany the manufacture of one product was made to lean upon another, and that fact, he believed, counted for much of the success of the German firms.

Dr. CAIN said that people were rather apt to generalise too much on the question. The author, no doubt, would not propose to make every intermediate in an intermediate works; but he would make certain intermediates and allow the dye manufacturers to make certain others. It was not quite the case that all the German dyeworks made their own intermediate products.

Professor Armstrong

Professor ARMSTRONG said that what the author was urging upon chemists was that they had to work together, and that they had to organise. It was not a question of producing this or that article here or there. We were hopeless optimists in this country. We had been "gassing" for years past, and particularly in the last few months, about what the chemists had done. It did not matter a bit what the chemists had done; it was a matter of what they were going to do in the immediate future. They had done far less in many ways than what they had given credit to themselves for. Anybody could make T.N.T., and such things, with a little practice, and with the opportunity which was given in early times to waste to any extent in making experiments.

The chemical industry was really started by Kaulber's discovery of salicylic acid, as he believed. He happened to be in Germany shortly before the time of that discovery, and he knew what the state of things was up to that time, and the extraordinary influence which that discovery had on the development of the chemical industry in Germany. It commercialised and ruined the majority of the German laboratories. It commercialised them by making it clear to them that it was desirable to make money out of chemistry. It spoilt them as educational institutions. His view was that, although Germany had gone up in the technical and commercial scale, she had been steadily retrograding from the scientific point of view. What he was most anxious to see avoided in this country was any sterilisation of scientific industry through Government grants. The Government were instituting a system which was bound to commercialise science, if care was not taken, by putting before the academic student the money bait.

He was very glad to hear Dr. Levinstein that morning say that it was the business of the universities and the schools to train men to be competent chemists and nothing more than that. Germany had done herself, as a nation, infinite injury by her system and by commercialising training. In his day in Leipzig twenty or thirty of the students would be at work on a similar theme, and each one of them knew what the others were doing. A few years later the thing was subsidised by the manufacturers, and, instead of the students being free to talk about their work, they were under the pledge of secrecy not to say a word about it. That had had a most serious influence. He did not want to see a similar condition of things in this country. It was being introduced, because the Government were giving grants on the condition that reports of the work should not be published without their being consulted and until they could see whether a patent could be applied for. He had the greatest respect for what had been done by chemists under the most difficult conditions; but if they were going not only to meet the wants of this country, but to secure that economic success which would make it possible for the industry to develop, it would be necessary to do a very great deal more than had been done or thought of.

Co-operation and Leadership

The thing to be done above everything else was to act on the lines laid down by the author when he said that a great co-ordination of effort was required, and, further on, that what the industry sought was leadership. An industry that lacked leadership was doomed, How was that leadership to be secured? That was the great problem of the future. If it could be secured within the next few years something would be done; but if it could not be secured nothing would be done. He happened to know practically all the men who had led in the German chemical industry during the last thirty years, and one knew what an extraordinarily strong crew they were. They were a crew who were prepared to row together and who had been rowing together for years. We had never had a crew of any size in this country that would row together in these matters. Until chemists could learn the first lesson as to the need for rowing together, they would make no progress. We had not got the men for a crew. We had a certain number of chemists who could do things in a laboratory when they were told; but we had not men of any imagination, any commercial grasp, men with any *savoir faire*.

He had been pleading for years that chemists ought to be highly paid in order that ability might be directed from the legal profession. Chemists were being paid a little more than they were, because prices had gone up, and it cost two or three times as much to live as formerly; but proportionately they were not much better paid. A city like Manchester could not rise to its opportunities. He suggested, a year or so ago, that Manchester should set an example and appoint a Professor of Chemistry at five thousand pounds a year. There was a great deal of ability in this country; but it had not been directed into right lines. Chemists needed to be "honest brokers." There was a great deal of talk about the advance of the industry; but what would be the opinion expressed if one went among the dyestuff users? Were they satisfied, not merely with the range but with the quality of the goods they were getting? The Germans in these matters had been, on the average, very honest in the past, and had supplied articles of

good quality and uniformity of quality. That fact would count for a great deal. Were chemists in this country doing the same? He was not sure that they were. It was to such points that attention must be paid. And it was of no use for chemists to bother themselves merely with Germany. There was the much more serious competition of America.

In the course of his reply Mr. EVANS said that he had been to Germany and there he had seen a vast organisation ready to send its materials over here at the earliest opportunity. Before going to Germany he spent three years with a number of manufacturers all over the place for want of someone to pull their forces together. Those manufacturers were very willing and very anxious to help. His paper really was a plea for leadership inside the industry.

The CHAIRMAN proposed a vote of thanks to the author, which was heartily passed. He said that he would like to know how far the idea which Professor Armstrong had expressed on the question of universities undertaking work for business or industrial enterprises agreed with the views expressed by Professor Perkin that morning. It seemed to him that there was a certain disagreement between the two learned gentlemen, because he rather gathered that Professor Perkin thought that it was a desirable thing for this country to follow the example set by Germany of making use of the exceptionally brilliant men at the universities and getting them to work in conjunction with large industrial concerns. That sort of thing, especially in the very early days of the industry, did lead to the making of very useful and brilliant discoveries of which the German chemical manufacturers made use. He would like to ask Dr. Perkin whether he would be good enough to say a word on that subject.

Professor Perkin

Professor PERKIN said that no chemical laboratory could flourish nowadays unless it was in connection with industry. The chemical laboratory had become an enormously expensive thing. The appliances and the buildings which were required, and the staff which had, of course, to be paid much more highly than it used to be paid, were so expensive that, unless the laboratory was connected with the industry, and got much material and much apparatus free, and unless it received Government grants, it simply could not exist. It was perfectly well known that the university lost something like £70 a year on each advanced student. Where was that money to come from if there were no Government grants or private benefactions, or something of that kind? Another thing: it was necessary to hold out to a man who was studying chemistry some hope that he would get some kind of remuneration later on. Money must enter into the calculation of every student. He must see his way to getting, ultimately, a decent salary after all the labour he had expended. With regard to the contact between the universities and the works, the type of research that was required by a works, especially an organic works, was practically the same as the kind of research, for instance, that was put into the investigation of an alkaloid. The methods were the same. If there was ability concentrated in the university, surely it was a mistake that the industry should not have access to that ability. He thought that many problems which presented themselves to the chemical manufacturer could very well be solved, and best solved, in the university chemical laboratory.

Our Future Patent Policy

Professor A. G. GREEN said that he wished to raise a point in connection with our future patent policy. It was only one of many points which would probably have to be considered. As members knew, there was a new patent law being considered by the Government. It was brought up some time ago, but had been postponed until after the war. The Society of Chemical Industry, among other societies, had been asked to make suggestions with regard to amendments in the present law and the proposed law. Everybody who had been engaged on war work knew the enormous assistance which the industries of the country had received from German patents. The Germans, of course, were aware of the fact that they had, by means of their patents, assisted this country tremendously. That must necessarily cause them to change their policy in future. He was credibly informed that they did intend to change it, and he thought that it was quite certain that they were bound to. In his opinion in future they would take out no patents with the exception of such patents as those in which the process was indicated by an examination of the end product. They would not take out any patents for intermediates in which it was not possible to tell from an examination of the end product how the thing was done. They would not take out patents for improved processes. There were very frequently a number of different ways of arriving at a result; there was a choice and one could not be quite certain about the matter.

That consideration must influence our policy in this country, because if we continued to patent things in the same way as we had done in the past we should be in the position that the Germans would know what we were doing, and we should not know what they were doing, and therefore would be placing ourselves at a hopeless disadvantage. Moreover, there would be no possible means of bringing home an infringement. An intermediate product might be sold upon the English market made by a process patented here; but one would not be able to tell, necessarily, or might not be able to tell, by an examination, what method had been adopted.

Then there arose the difficult question of how prior use was to be established if people here did not protect their inventions. It would seem that two courses were open. One was to make some amendment in the patent laws, by which possibly a patent for an intermediate, where it was not possible to tell from the final product what it was, or for an improved process, might, at the discretion of the Board of Trade, be kept secret for a certain number of years. Whether that was possible or not he did not know; but he thought that something of the kind should be considered. The only other thing was to keep the process secret. That, of course, was a very great disadvantage in many ways. To keep a process secret indefinitely, tended to prevent further progress. Then how was prior use to be established? The question of prior use was one upon which the lawyers did not seem ever to come to a descision. What was prior use? If a chemist worked out a process in the laboratory and made a few hundred grammes, but did not manufacture, and then somebody else came along and took out a patent for that process, could the chemist, by bringing forward his laboratory books, and showing that he had made the substance, establish prior use and upset the patent? He was informed by patent solicitors that in this country there was not a law which was similar to a law which existed in Germany. In Germany, if a patent was taken out, if a man came along afterwards and showed that he had worked the same thing before, and proved it conclusively, the patentee could take no action against him; but the patent remained good as regarded the rest of the world. It was still sound. He was informed that in England a patent was either invalid or valid. If it was invalid as against one person, it was invalid as against the world. If one single man could come forward and show that he had used the invention before, the subsequent patent was invalid. How was prior use to be established if a process was kept secret?

Everybody seemed to be more or less agreed that, if a process was only put into operation in the laboratory it was only in the nature of an experiment and could not be looked upon as being worked commercially, and it was not quite certain that prior use could be established even if the process was put into commercial working, that is to say, if the product was sold, as long as it was sold secretly, and as long as the process did not show on the face of it how it was made, as a machine did. Therefore, as things stood at present, the inventor was merely thrown back upon the position that if he kept the thing secret he was doubtful whether he was safe; a subsequent independent inventor who also patented the process might possibly prevent him from working his own invention. The present state of things was very unsatisfactory, and something required to be done. He thought that it would be very useful to consider the matter and prepare in advance for the new position which was certain to arise, because German inventors would not take out patents in the free way in which they had taken them out in the past.

The CHAIRMAN said that it was a very great advantage to have Professor Green's remarks upon the very important problem of patent policy. They certainly raised some very difficult questions which should be thought over in wide circles and discussed at a later date.

Manufacture of Synthetic Drugs

MR. F. H. CARR (Chief Chemist, Boot's Pure Drug Company, Limited), read a paper on "the Manufacture of Synthetic Drugs."

MR. CARR said that organisation among the firms engaged in other branches of chemical industry had made great progress, but in regard to synthetic chemicals much remained to be done. It was imperatively necessary, by making agreements or by other means, to prevent useless overlapping, to capitalise each manufacture so that its engineering equipment was of the best, to establish an intimate financial connection between the making of the primary, intermediate, and finished products involved, and, lastly, to achieve, where needed, technical co-operation.

Salicylic acid was mentioned as an example to illustrate the present position of affairs. There are in England about twenty firms making between them less than ten tons per week of this substance—an amount which might conveniently be produced under the supervision of two or three chemists. Only by the manufacture being undertaken here as in Germany on the requisite scale by two or three corporations can we obtain equal advantages for the manufacture of synthetic drugs of this class. Two proposals were suggested: (1) That a large group of the present makers should close down their plants and combine in a united effort; (2) That one or more of the large makers of dye intermediates should manufacture these synthetics and supply them in both crude and purified state, as desired, solely to a group of the present manufacturers, who could, if they chose, purify the crude products and thereby continue to supply branded material of the quality and specification for which they have established a reputation. The former plan would possess many of the advantages of co-operative effort, but would be subject to the disadvantage that if such an amalgamation produced its own intermediates the scale would still be small compared with that on which the dye producer makes the same substances, and

should it not do so it would not purchase them as cheaply as the intermediate maker would produce them; but this plan has a greater difficulty in that the various firms combining would need to sell goods of identical price and quality, which it is feared would be unsuited to businesses which are concerned with branded articles of special quality. The second proposal would possess the advantages of large-scale production and technical co-operation, yet would allow the firms so desiring to purify their own finished products and thus to maintain their separately acquired reputation. To adopt such an arrangement would be a step towards a more complete and coherent combination of interests which might follow. In the manufacture of many pharmaceutical chemicals there remains room for individual achievement, and any satisfactory organisation of the industry must secure the fullest and freest scope for such effort. Side by side with concerted arrangements for the production of staple lines should develop co-operative purchase of raw material; in all other respects free and honourable competition might continue. Mistrust which now exists would be slowly dissipated by working together in this way. Such business arrangements must, of course, be the spontaneous outcome of individual firms and cannot be directed by trade associations, still less by the Government. Nevertheless it is the duty of a Government giving protection to an industry of this kind to watch the trade in order to ensure that the protection is being utilised to national advantage and not merely being employed for private gain.

Board of Trade Attitude

Captain L. M. NASH (Department of Industries and Manufactures, Board of Trade) said that he had listened with very great pleasure to Mr. Carr's able paper, and to the earnest plea that he had put forward for co-operation. He would like to say a few words about the prohibition of imports. When the war started, there were a number of chemicals for the supply of which this country had previously relied upon Germany, and which it was necessary to make here. They had to be made under very great difficulties with any old plant which could be scraped together, and in any old building which could be got hold of, and more or less regardless of expense. They were wanted, and they had to be turned out. Now the war was over. If those chemicals had been allowed to be imported from Germany straight away, the new industry which had been built up so capably by the manufacturers must have died a sudden death. On the way in which chemists used the term of grace depended the question whether the day of the death of the new industries was merely postponed, or whether they were to be firmly established in this country. He felt very strongly that, unless chemists utilized the time for working along the lines of co-operation, so ably expressed by Mr. Carr, they would only be postponing the day of the death of the industries. Those who had been privileged to see the large works in Germany must have been convinced that it was not possible to turn out the things in back yards, or in lots of a few hundredweights. The manufacture must be carried on on a large scale in order to secure economy of production. Therefore, he earnestly hoped that something would be done in the direction suggested by Mr. Carr. The next point to which he wished to refer was the question of quality. He hoped that Professor Armstrong's words on that point would be taken to heart. He had no doubt that many of the new chemicals were already satisfactory as regards quality; but he believed that in other cases the standard of purity was not yet such as obtained before the war in the case of imported chemicals. He hoped that chemists would give full attention, not only to maintaining the quality, but to improving the quality, of those chemicals, so that, if and when the time came when the new industries were no longer Government-protected and supported, the chemists would be able to maintain their position against the world.

Another question was that of price. The prohibition was put on simply and solely to enable chemists to put their house in order, and if it was regarded by them merely as a means of enabling them to increase their profits, then they would have entirely failed to grasp the value of the prohibition. It could not be doubted that attention would be drawn in the House of Commons to any rise of prices which might ensue from the prohibition; and it was only to be expected that the manner in which the prohibition was used would be taken into account by the Government when they formulated their future trade policy. He did not want to labour the point about price; it was a difficult thing to speak of at that gathering; but he was sure that those present would realize what he had in his mind when he said those few words on the subject. There was one more point that he wished to mention. In the past, chemists might have had occasion to go to the Board of Trade in difficulties on various points, and they might or might not have found it very easy to get an audience. He had been a member of the Society for something like twenty years, and he now found himself in the Board of Trade, and he could only say that if any manufacturers wanted to come to the Board about anything he would be only too glad at any time to extend a cordial welcome to them, and although he could not promise to do everything they asked on all occasions, yet he could at least assure them of a sympathetic hearing, and he would be glad to do anything he could for them.

Dr. Levinstein

Dr. LEVINSTEIN said he did not think that there was any change which had taken place in the national life during the last five years which was comparable with the change of attitude on the part of the Departments. The statement made by Captain Nash was one which the members would very greatly welcome.

With regard to Mr. Carr's paper, he wished to say that it differed from other papers dealing with organisation. Mr. Carr put forward a perfectly clear, well-thought out, and satisfactory scheme for the organisation of the industry. The dye industry would welcome any constructive proposals that were put before it in which it could participate to the advantage of the country, and in the development of the fine chemical and pharmaceutical industry. He was rather inclined to deprecate the general statements which were sometimes made as though anyone did not know that organisation was one of the prime needs of commerce at any time. There was a great difference between telling people to organise, and thinking out and creating a satisfactory organisation. He would like to say to some people that organisation did not consist in combining in one rotten centre all the people who had been successful or unsuccessful in making profits out of fine chemicals or dye stuffs during the war. Perhaps if that point were fully appreciated by gentlemen who talked about organisation, it might be possible to come more quickly to the kind of position which everybody desired. He agreed with Mr. Carr that such amalgamations, or such working arrangements as Mr. Carr proposed, must come from the industry and not from trade associations. He would like to point out to Mr. Evans that the great power of the I.G., the constitution and composition of which Mr. Evans so entirely misunderstood, lay in the fact that all the members of the I.G. pooled their profits. Any real organisation of our present industrial system involved the various people who were organised, possessing a common financial interest in the success of their respective undertakings. The I.G. controlled in Germany the manufacture of heavy chemicals, and also at the same time the manufacture of fine chemicals, pharmaceutical products and dyes. It was the fact that the profits were pooled, and that each firm got its *pro rata* portion of the total profit of the I.G., irrespective of the source at which the profits were made, which rendered the I.G. such a potent weapon in the hands of the German Government.

Dr. D. LLOYD HOWELL said, that he should like to emphasize what Mr. Carr had said with regard to the desirability of the fine chemical, and the great synthetic drug firms not endeavouring to work for the survival of the fittest but working in co-operation. He felt convinced that it would pay all parties if, say, the old fine chemical firms, who, before the war, were not much engaged in synthetics, but were engaged in other branches of medicinal chemicals, in which they held their own sufficiently well for it to pay the Germans better to agree with them than to fight them, instead of each one endeavouring on its own account to make salicylic acid or what not, combined with the great gas companies and the producers of dyes and intermediates, and either bought from them the materials required in medicinal work in small quantities and refined them, or else combined to buy the whole of the refined products and put at the disposal of the larger firms the world-wide selling organisation which the old makers of pharmaceutical and fine chemicals possessed. He entirely recognised the weight of Dr. Levinstein's observation that it was quite an easy thing to talk about organisation, and a very difficult thing to come forward with a concrete, thought-out scheme. He confessed that he had no such scheme. It was a thing that must come, so to speak, from within. It could not be imposed by a Government Department. He thought that if the producers of synthetic chemicals on a large scale were willing to work with the old manufacturers of fine pharmaceutical chemicals, some co-operation might result which would enable chemists to keep the Hun, the Jap, and so on, out.

On the motion of the Chairman, a hearty vote of thanks was accorded to Mr. Carr for his paper.

Photographic Chemicals

Dr. W. R. INNES (chief chemist to Kosmos Photographics, Ltd.), in a paper on "The Raw Materials of Photographic Plate and Paper Manufacture," said the shortage of glass of photographic quality was one of the greatest difficulties met with during the war. A considerable quantity used to be obtained from Belgium, the remainder being of English make. Belgian glass, in diminished quantity, continued to come into this country during the earlier years of the war. When shortage of labour became serious, supplies fell off and manufacturers were forced to clean and re-coat old negatives. No photographic raw paper or card was made in this country before the war. Germany, Belgium and France supplied practically the whole of the raw paper, whilst the baryta coating was almost all carried out in Belgium or Germany. The papers of best quality were neutral, very free from metallic particles, strong and well-sized, whilst the baryta coating was neutral, hard, and yet tough and the paper was very free from mechanical faults. During the war several firms in England and France commenced the manufacture of photographic raw paper and card. Considering the difficulties of

manufacture in factories not specially built for the purpose, considerable advances were made in several directions, but there are still a number of serious faults to be eliminated. Perhaps the most serious are acidity, and the presence of microscopic particles of iron and bronze. Of substances used in smaller quantity than those already dealt with, the supply of glycerin was completely stopped early in 1918, whilst the supply of spirit was restricted. Satisfactory substitutes for both substances were found, and it was not found necessary to use spirit from the date of the restriction. The supply of dyes for various purposes offered some difficulties. The most serious shortage was that of the panchromatising dyes derived from substituted quinolines. These dyes were solely of German manufacture. They had been successfully replaced by the much superior dyes discovered by Professor Pope. The most unsatisfactory chemical of war-time make was chrome alum. All samples examined, except those specially prepared, were impure and badly crystallised.

Laboratory Chemicals

A PAPER on "The Organised Preparation of Laboratory Chemicals," by Dr. M. O. Forster, F.R.S., Director of the Salters' Institute of Industrial Chemistry, was in Dr. Forster's absence taken as read.

In the paper it was pointed out that the resumption of normal activities by the universities and colleges will bring into prominence the pressing need of some organisation fulfilling the functions of Kahlbaum, Schuchardt, Merck, and Schimmel.

In order successfully to develop one basic idea, an average of at least fifty preliminary experiments must be made. Many of the materials for these fifty experiments were not to be found in even the best-equipped laboratories, and if they were not readily obtainable elsewhere, some of the fifty experiments, including, perhaps, the one potentially successful experiment, would not be made. Laudable attempts to meet the need were being made by certain manufacturers in this country, but they required to be amplified and co-ordinated.

Schuchardt's list comprised upwards of 7,000 separate items, and Kahlbaum's about 5,000. No other commercial unit approached this, or could approach it in ten years, but he could imagine Explosives Trades, Ltd., or the British Dyestuffs Corporation, establishing a branch of their organisation to deal with the subject on lines which may be roughly sketched as follows. A census would first be made of those materials which are being produced already by separate firms, with whom arrangements would be made for their continuance, as affiliated members of the organisation, to manufacture those products, and others allied to them, for which they were best fitted by their particular resources. This would reveal the deficit, dividing itself roughly into two classes: (1) Bulk materials obtainable from different factories in commercial form but requiring purification before distribution, and (2) Materials not made systematically in this country. The former would be purchased from the factories in question; the latter would be prepared by the staff of the Central Organisation, or better, be divided between that staff and the university laboratories under an arrangement by which advanced students, directed by the teaching staff, would convert specified raw materials into products required by the organisation.

It was undeniable that such an enterprise would be unremunerative at first, because it involved the skilled manipulation of a very large number of very small quantities, and because a considerable proportion of capital would be locked up in stock for uncertain periods, often very protracted. It is therefore necessary to indicate some commercially compensating factors. In the first place, successive generations of newly-trained chemists would grow accustomed to inquiring for British products and to satisfying their needs from domestic sources of supply. It would sometimes happen that a by-product in the bulk preparation of a commercial article could be utilised for the purpose of the retail enterprise, and a demand for this by-product would have the effect of diminishing the cost of the article itself, or of improving the methods of purification. This aspect of the work, thus brought immediately to the notice of the colleges, would stimulate attempts to devise novel and profitable ways of utilising by-products. Finally, the least easily measurable, but probably the most valuable result commercially would be the cultivation of ideas preserved from destruction following malnutrition. This could not fail to bring profit ultimately to the chemical manufacturer, who, when enlightened, regarded ideas as one of his raw materials.

The Chrome Tanning Industry

Comparative Positions of America and Great Britain

AT the Goldsmiths' Hall on Thursday morning, July 17, a conference was held on the chrome tanning industry. Mr. Francis H. Briggs, President of the Federation of Curriers, Light Leather Tanners and Dressers, presided.

The SECRETARY of the Local Executive Committee, Dr. Charles A. Keane, expressed to Mr. Briggs the thanks of the Society for his kindness in presiding. He said the Society consisted of chemists, but they liked to meet those in special industries who were related to chemistry in other directions.

The Chairman's Address

The CHAIRMAN said it afforded him great pleasure to take the chair at that meeting, and to be associated with the very important work of the Society, especially because the subject of tanning had been very greatly neglected, and consequently every man interested in the production of leather, especially chrome leather, welcomed the opportunity of meeting chemists and furthering the object in view—the production of chrome leather. The process of chrome tanning was one of profound interest from a national standpoint. It was to be greatly deplored that such a process had been neglected, more so when it was remembered that the Empire controlled the greater portion of the raw material. In India alone the hides were in the neighbourhood of some twelve million, and whilst the whole of the production some ten years ago was dealt with in this country by a process of vegetable tanning, in the year 1913, 80 per cent. of those hides were dealt with by the Central Powers, and the majority made into chrome leather. It was also to be regretted that a very large portion of that chrome leather found its way back to London. It was an extraordinary procedure for a country to secure the monopoly of a raw material and then allow it to go out to people like the Central Powers to be tanned, and then buy it back for use.

Then there was glacé kid, which was produced from goatskin. As in the case of hides, India exported some twenty-one millions of raw goat skins, and only two million of that twenty-one millions were dealt with in the United Kingdom. In 1913, half-a-million of that two million was re-exported because we were unable to deal with it. Between 30 and 40 per cent. was tanned and dressed and made into glacé kid, and re-imported to England for the use of our boot manufacturers. He could not help feeling that a great deal of that was due to the world of science. One of the greatest authorities on the subject before the war was an Austrian. The Austrians, the Germans, and especially the Americans had fostered that process of tanning to such an extent that they had left this country high and dry to look on, and he regretted that we had been so slow in not pushing forward with the raw material which the Empire placed at our feet.

The object of the Conference that day was to hear from Professor McCandlish and Mr. M. C. Lamb, some points associated with the chrome industry, which would help in placing this country amongst the nations of the world engaged in the industry, and enable the leather producers of the country to deal with the raw material provided by the Empire instead of leaving it to go away and buying it back again. It was a national disgrace that the material should be sent out of the country, and he sincerely hoped that the time was not far distant when the material would be dealt with in this country.

Chrome Tanning Industry in America

Professor J. D. MCCANDLISH (Professor of Applied Industry of Leather Manufacture, Leeds University), in the course of a paper on "The Development of the Chrome Tanning Industry in the United States of America," said it was not surprising to find that the chrome process was favourably received in the States, for its

outstanding feature, that of producing a serviceable leather in considerably less time than it could be produced by prevailing methods of tanning, appealed strongly to the Americans' inborn desire for speed.

The commercial employment of chromium compounds as tanning materials in America commenced about 1884, when Augustus Schultz of New York was granted a United States patent for what he described as "an improved process for the tawing of hides and skins." Schultz was born in Germany in 1834 and moved to America in early youth. He was not a tanner, but whilst employed as chemist to a New York dyestuff agency was asked by a friend if it were possible to produce a leather that would not cause corset steel to rust, as ordinary alum-tawed leathers did. His investigations resulted in the production of a leather with the desired quality, and the method suggested was now universally known as the "two-bath process." In this method of tanning, the skin was impregnated with chromic acid, which was readily absorbed by the skin fibres in the first bath. The chromic acid was subsequently reduced in a second bath to a basic chromium salt, which was the actual tanning agent. A mixture of sodium or potassium bichromate with hydrochloric or sulphuric acid was used for the first bath, and a mixture of sodium thiosulphate with either of these acids constituted the second or reducing bath. The practical application of the process presented many difficulties, and whilst these were gradually overcome, fairly large fortunes had been lost by the American pioneers in the chrome tanning industry.

It was by the gradual improvement of various processes rather than by any revolutionary changes, that progress has been made in the chrome leather industry in the United States. Considerable changes had taken place in the methods of depilating. The use of sodium sulphide, either alone or in conjunction with lime, had entirely supplanted the use of milk of lime as the medium for loosening the hair. The time required for the operation was shortened considerably, but, more important, the hide substance was conserved and a better grade of chrome leather resulted. The old system of puering or bating with animal excrements had been almost entirely superseded by methods having none of the objectionable features of the old methods. The most successful artificial bates are those prepared on lines suggested by the researches of J. T. Wood, the active principle of these being trypsin, obtained from the pancreas of cattle. The actual tanning processes had been greatly improved. American chemists are doing good work in elucidating the problems of chrome tanning. A development which may have far-reaching effect was the utilisation of mineral oils for fat-liquoring purposes in conjunction with salphonated animal, vegetable, or fish oils, which were excellent emulsifying media and possessed lubricating properties themselves. A noteworthy addition to the mordants available for use upon chrome leather previous to dyeing with aniline colours was made a few years ago. An extract prepared from osage orange wood, introduced under the name of Aurantine, had found successful application as a substitute for fustic extract. In the finishing operations considerable ingenuity had been exercised in devising means of overcoming defects in the skins and improving the appearance of the leather.

Steady improvement in the quality of chrome leather has been made by the American tanner as the principles underlying the process had been better understood, and he had earned and maintained a well-deserved reputation for the character of his goods. The Chicago packers, who controlled a large portion of the raw hides and skins of the country, had recently entered the chrome tanning business, and this might eventually lead to a still greater development of the industry of the future. Whilst progress has been made in the technique of leather manufacture, great advances had also been made in labour-saving machinery.

The British Chrome Tanning Industry

A paper on "The Progress of the Chrome Tanning Industry in Great Britain" was read by Mr. M. C. Lamb (director of the Light Leather Department of the Leathersellers' Company's Technical College).

Mr LAMB reviewed at length the methods of mineral-tanning, beginning with Professor Knapp's process. The process of chrome tanning, he said, was apparently dependent upon the impregnating and covering of each individual fibre with a coating of a basic chromium salt or oxide, thus preventing the fibres subsequently adhering when the leather was dried, and at the same time so protecting the fibres that the leather was capable of withstanding the action of boiling water and other hydrolysing agents. One of the obstacles to progress in the manufacture of chrome leather in the early days of its introduction was the uncertainty which existed as to the chemical reactions which were involved. The reactions in the double-bath process of chrome tanning was complicated.

Eitner, about 1905, after studying this process, proved that under certain conditions the reaction between the chromic acid and the acidified thiosulphate resulted in the production of a basic chromium sulphate, as shown by the following equation :—

$$K_2Cr_2O_7 + 6HCl + 3Na_2S_2O_3 \rightleftharpoons 2KCl + 4NaCl + Na_2SO_4 + 2Cr(OH)SO_4 + 2H_2O + 3S$$

which was confirmatory of the statement that the tannage was due to the production of a basic salt. In the tannage, hides for "box" leather, calf, &c., the single-bath process was universal in this country, and it was generally considered that a basicity between 85 and 95 ($Cr : SO_4 = 52 : 85–95$) was most suitable.

The chrome leather industry in Great Britain had attained very considerable importance. Whereas, prior to 1900, the bulk of the leather manufactured for the purpose of boot uppers was of vegetable origin, practically the whole of the leather used in the manufacture of the better quality boot uppers was now of pure chrome tannage. Chrome leather was used to the extent of 20% in the manufacture of boots for the Army during the recent campaign. Its behaviour on active service was all that could be desired, and the only reason why a much larger amount was not employed was on account of the lack of tanning facilities. Chrome-tanned sole leather was being made in very large quantities, and whilst there was still a considerable amount of public prejudice to be overcome and this method of manufacture was not applicable to the tanning of sole leather from all classes of hides, it would appear probable that this method of tanning will further extend, as the wearing properties of chrome leather are greatly in advance of those of leather tanned with vegetable products, and the tanning process only occupied about one-fiftieth of the time necessary in the latter case. It is somewhat curious that this method of tanning sole leather has not been practised to any very large extent in America. One of the earliest objections to the employment of chrome leather for soling boots, *viz.*, the liability to cause slipping when in wear, particularly on wet pavements, has been almost entirely overcome by impregnating the leather with hard waxes.

The paper Mr. Lamb said, would be incomplete without reference to the very important industry which had arisen from the chrome tanning process *viz.*, the manufacture of semi-chrome leather. This leather was prepared by first removing a portion of the original vegetable tannage from an already tanned leather by means of a weak alkaline solution, and afterwards re-tanning with a basic chromium chloride solution. The dyeing, fat-liquoring, and finishing operations are almost identical with those practised on real chrome leather.

Discussion

The CHAIRMAN asked Professor McCandlish whether, in using the words "each 24 hours," he meant an eight-hours working day, or whether there were various relays of workmen.

Professor MCCANDLISH said the output was per working day.

Mr. GRANT HOOPER said that from an industrial point of view there was a possibility of a very important development, and the question was whether the right lines had been hitherto followed in connection with the industry. The fact that such a large number of hides were drawn from our own colonies and dependencies, and that they went very largely to the Continent to be dealt with, and were then brought back to England, raised a question as to whether such a procedure should be allowed to continue. When one asked oneself the reasons for the great success that the chemical industry undoubtedly had in Germany, he thought the conclusion would be come to that it had been very largely due to the combination of bodies into large organisations and trusts. It was something of a reproach to this country that we had preferred to continue our individual career each in our own little way rather than to combine into larger organisations, through which alone could the full advantage of scientific assistance be obtained. It had been the complaint of chemists that they had not been sufficiently recognised in England, and he thought that would readily be admitted to be the case. It might be that a comparatively large works might be disinclined to incur the very considerable expense, but as soon as a large organisation was developed with the proper staff, the best knowledge could be made available, and he pressed upon the trade to consider the possibility of such a combination as he had suggested. He did not think the chemists could be reproached ; the question was whether the trade had made as much use of the possibilities which had been placed before them by the chemist as they ought to have done.

The CHAIRMAN remarked that the industry was possibly commencing to do now what they should have commenced fifteen or twenty years ago. Many firms now were spending up to £5,000 a year in research work associated with chrome tanning, and the idea of employing a chemist for research work was thoroughly well understood and there was a great opening for chemists in that direction. English people were very conservative, and many thought their little tannery was everything. Men had been somewhat jealous and had not allowed their neighbours to know what they had been doing. That, he hoped, was a thing of the past. He hoped that men of science would feel that the trade was out for the best, and he agreed that the best could only be obtained by co-ordination. Whether it was necessary to combine on a large scale was a question for the various firms. The trade was alive to-day, and it was only a question of its being backed up by science.

Mr. RICHARDSON said that many manufacturers to-day were developing into chrome and feeling their way. He himself was going into it very cautiously, as a separate branch of an existing business. He should like to know whether, in the opinion of the Professor, it was commercially possible for a steady, quiet business man successfully to produce in a moderately large way against a great combine. Many manufacturers had very old family businesses which they looked upon with pride, and they did not wish to lose their personality.

Position of the small English Tanner

Professor MCCANDLISH said Mr. Richardson had raised rather a wide question, whether it was possible for the small English tanner to compete with the large American tannery. One particular firm in America, that he was well acquainted with, had, roughly, the following history. A practical working tanner set out from Germany without any means of any kind, and located himself in a small city in Western America, starting a tannery which he operated absolutely alone. He bought half-a-dozen skins from the market, took them home, and worked them through all the different processes himself, and turned out a finished leather. All the leather that was made was readily absorbed by the boot manufacturers, and the man had foresight enough to see that if he doubled his capacity he could still make money, and from that small beginning the tannery developed in the course of 25 to 30 years into a tannery which was turning out 5,000 skins per working day, and no outside capital had been brought in. That tannery was still extending, and employed a staff of about eight or ten chemists. The tanner saw that there was something to be gained from employing a chemist, and employed one as an experiment, and, having found it paid, gradually built up his chemical staff to keep pace with his industry. That particular firm was expending money on research at a larger figure than £10,000 every year; he put money into something which he saw was a money-making undertaking. The American Leather Chemists' Association was a very healthy and growing body, and proved that leather chemistry had played its part in the practical manufacture of leather in the United States, probably at rather a greater speed than it had done in England. He did not feel in a position to answer Mr. Richardson's question as to whether the small English tanner could compete with the American tanner, but he should say that the chances were that he could compete, and he believed Mr. Briggs would bear him out when he said that the glace kid produced by the English tanner was equal in quality to the best American grades of leather—that the leather produced here was as good as was produced in America. That it was not produced in the same quantity was something for the tanner to answer, not for the chemist.

Mr. INNES said that with regard to the employment of chemists in the tanning industry, it seemed to him the whole thing came back to the subject of education. If the tanners of to-day had been taught science when they were at school, he thought there would have been more hope for them as a body, and the chemists would have got into the industry earlier. As a nation Great Britiain practically neglected science; if they had not they would have had science on the schedule of the school curriculum, and everybody would have known more about science than they did. Recently a party had been over to Germany in the occupied area, and had visited the tanneries, and of all those they had visited he was told that only one had a chemist. That struck him as being so absolutely at variance with the prevalent notions that he thought there must be some mistake, and therefore he would ask Professor McCandlish what the conditions were like in America. Professor McCandlish had mentioned one case of a firm employing eight chemists, and he was wondering whether that was a representative case or an exceptional one.

Dr. SAGE said he had attended conferences in America, and there the discussion of such a subject, say, in Chicago, would have attracted an audience at least ten times the size of the audience that day. If in addition to the quantity of hides coming from the Colonies the quantity that came from Belgium and the East were taken into consideration, and the statistics examined as to where those hides were placed, it would be seen how far Great Britain as a nation was behindhand in the matter of tanning. There was now an opportunity of getting away from old-fashioned methods; but there was an opportunity of starting on new lines. He was not sure that it would not be wise to take as a lesson the alkaline trade combination and have a combination of chrome tanning and leather makers with the special object of going ahead.

Co-ordination of Science and Trade

The CHAIRMAN said there had not been sufficient co-ordination between the scientific man and the trade, and that was the whole root of the evil. If scientific men could solve the questions in Germany and in the United States, they could do so in England. The Leathersellers' Company were quite alive to the position. It was hoped sooner or later to have for the trade a research institute associated with the two Federations for the advancement of scientific research.

Professor MCCANDLISH said with regard to the question of whether the employment of chemists by the American tanners was general, he thought he could safely answer that it was. Taken as a whole the American tanners were making more use of chemists than the English tanners had done in the past.

Mr. M. C. LAMB said he had had some considerable experience in connection with the educational question, and so far as the Leathersellers' Company was concerned, which was training youths for the leather industry, it had generally adopted the principle of advising parents who intended sending their sons direct from school that it was the wrong procedure; that the first procedure was that they should have twelve months' practical training before they came to the college. In that way the young man assimilated a certain knowledge of the industry and was better able to grasp the scientific facts which were placed before him, and his training was undoubtedly benefited. There were two classes of individuals to be trained. There was the chemist, who had to specialise, and the youth who subsequently was to become a foreman or assistant manager, and ultimately fill a managerial position in the works. The training of those two should be entirely separate. The chemist who was specialising should go through the ordinary University training as a chemist. Whether before he studied the technicalities of the industry and specialised in leather he should go into the industry for a year was a matter of some debate, but there was no doubt that the youth who was eventually to take an administrative position should have his original training supplemented by practical training before he obtained his science training.

Professor MCCANDLISH said that in the Leather Department of the Leeds University the prospective student was usually advised to seek practical experience before entering upon the course of specialising in leather chemistry.

A DELEGATE said he had heard there was a difficulty in obtaining chrome chemicals during the war, and wished to know if that difficulty still existed, and what were the resources for chrome chemicals in this country. In Canada recently there was a difficulty in getting sodium chromate, and also a difficulty in getting export licences from the United States to permit the import of sodium chromate.

Mr. CHALLIS said that lately a new process had been advertised with regard to chrome tanning, and he should like to know if the process was likely to beat the present method of chrome tanning, or stood an equal chance with it.

Mr. LAMB said there was no diminution in the production of chrome leather owing to the lack of chromium compounds.

Dr. SAGE said he thought chromium went to the United States to make chrome steel.

Mr. RICHARDSON said that as far as he was concerned he should not care to have anything to do with the new process.

The CHAIRMAN said the new process was practically in its infancy. He should prefer to lose a few hundred pounds a year if he could encourage mineral tannage or other tannage. It was rather too early to say anything about the new process, and he would prefer to leave it until it had a better footing. He did not think there was any fear of its beating chrome leathers.

All-round Co-operation

Mr. WOODROFF said that as a chemist trained in leather, and one who had passed through one of the Institutes, he should like to say that he thought the discussion was getting very near to the root of the matter as to why the chrome tanning industry had not made more progress in this country. It was not the tanner's fault, and it was not the chemist's fault. There was no co-operation between the chemist and the tanner on the whole. There were process chemists in many other technical branches, and analytical chemists as well, but he believed that in the tanning industry there were no process chemists, and until process chemists came into the trade who understood the process of tanning there would not be very much progress. He believed that as good leather could be made in this country as in any other country. At the present time it was difficult to obtain machinery, and there could be no progress unless engineers were prepared to co-operate, and what was required for the chrome tanning industry was more co-operation all round between the tanner and the chemist and the other trades.

The CHAIRMAN said the discussion had been an exceedingly interesting one, and the keynote was that the chemist, the scientific man, and the tanner desired a greater co-operation in the future than there has been in the past. He had no fear with regard to the future.

On the motion of Dr. SAGE, a vote of thanks was passed to Professor McCandlish and Mr. Lamb for their papers.

Professor MCCANDLISH, in replying to the vote of thanks, said one thing that had not turned up that morning was the question of tariffs, The American chrome tanning industry was built up behind a tariff and that tariff remained in force for a great number of years, and was

only taken off chrome leather in recent years. He was in America at the time when the tariff was removed, and he could say that the chrome tanners of America got rather a severe fright. The output was affected and German leather came into the United States in very large quantities, when the war started and put a stop to it. The British tanner had had to face a real difficulty in having to compete with cheap labour in Germany, and the highly organised production of America, and those two things had been really severe for the English tanner to face in an open market.

Dr. KEANE, in proposing a vote of thanks to the Chairman, felt sure that the publication of the papers would do a great deal to stimulate interest in the subject. On the question of training there was a good deal to be said for a man going into the works before going to college, and there was also a good deal to say on the other side. It all depended on the right man. If a man with a knowledge of science went into works, and he was made of the right stuff, he would do all right, and the man with a knowledge of the works going into science would do the same if he was the right man. The whole thing was to imbue students with responsibility. With regard to the development of the industry, the same story was told in other industries—restriction by the lack of appreciation on the part of the manufacturer of the chemist and lack of encouragement of research. There was the same story in education. In the chemical industry the chemist had been to blame, the manufacturer had been to blame, the manager had been to blame, and the business man had been to blame, and there was no help in putting the blame on to somebody's else's shoulders; each had to share a bit of it and make up his mind to pull together in the future better than in the past. The war had shown the immense advantages which could be effected by co-operation, and the greatest lesson in reconstruction was to carry throughout science and industry the principles which had been followed so well during the war, and apply them to such technical problems as had been discussed that morning.

The CHAIRMAN briefly thanked the meeting for the vote, and the proceedings closed.

Recent Developments in the Fermentation Industries

A Conference on "Recent Developments in the Fermentation Industries" was held in the Goldsmiths' Hall, Foster Lane, on Thursday afternoon, July 17, Sir James Dobbie, F.R.S., President of the Chemical Society, occupying the chair.

The CHAIRMAN said that most of the wonderful and infinitely various chemical changes that occurred in the animal and vegetable kingdoms were due to the action of either organised or unorganised ferments, and it was not surprising that fermentation processes should be used at a very early stage in the history of mankind, and accordingly it was found that such industries as the production of wine, beer, vinegar, and the tanning of hides were amongst the most ancient in the world. Wine-drinking was referred to in the early books of the Bible and in the contemporary records of ancient Egypt, Greece and Rome, and the oldest representations of the grape harvests and the manufacture of wine showed that the methods employed 5,000 years ago were not essentially different from those employed to-day. Beer also was no modern invention. The vast extent of the fermentation industry employed in the manufacture of alcoholic beverages might be understood by the perusal of the official returns of this and other European countries, the United States of America and the principal British dependencies. It appeared that the annual average production of wine was about 4,500 million gallons, requiring for its manufacture over 30 million tons of grapes. Of beer over 6,000 million gallons were produced, requiring from 5,000,000 to 6,000,000 tons of grain. Spirit amounting to over 450,000,000 gallons of pure alcohol consumed about 5,000,000 tons of potatoes, over 4,000,000 tons of grain, and about 2,000,000 tons of molasses, syrups and grapes. It was more than a thousand years since the alchemist succeeded in extracting spirit or alcohol in a comparatively dilute form from wine, and the use of alcohol, except for medicinal and drinking purposes, was quite a recent development. The invention of fractionating apparatus had made possible the production on a commercial scale of alcohol of sufficient concentration to permit of its use for lighting, heating and many other important industrial purposes. The yeast industry was naturally closely bound up with the production of alcohol, which was in many cases only a by-product of yeast manufacture. During the war the quantity of yeast produced from a given quantity of grain was doubled without any considerable loss in the amount of alcohol produced. Ethyl alcohol could be produced from such compounds as ethylene, acetylene, and even from sediments; but so far those processes had not been successful on a manufacturing scale, and the time still seemed far distant when the production of alcohol would cease to be the principal fermentation industry. The manufacture of other important commercial products such as acetic acid, depending upon fermentation methods, had only quite recently been subjected to control on scientific principles, and the range of fermentation industries extended as the result of research. Before the war the manufacture of butyl alcohol excited much interest in connection with the artificial production of rubber, and under the stimulus of war the manufacture of acetone became a national concern of the first importance, and the process, he was glad to say, formed the subject of two papers to be read that afternoon.

The Manufacture of Acetone

Colonel Sir FREDERICK NATHAN, in a paper on this subject, said that before the war the main sources of acetone were the United States and Austria, in which countries it was produced from acetate of lime made by treating acetic acid with lime. Acetic acid itself was obtained by the destructive distillation of hard woods in iron retorts. Austria ceased to be a source of acetone when war broke out and the United States became the only source of supply, the quantity produced in this country being practically negligible as compared with the large and rapidly increasing requirements of this solvent for the manufacture of cordite and aeroplane dope. Steps were, therefore, taken to augment the American output from acetate of lime, and in addition a contract was placed with a firm who adopted a process for making acetone from vinegar, but although the process proved a success up to a point, the yield was poor and the price was very high, and it was eventually abandoned.

Two other methods of producing acteone formed the subject of much experimental work. Both were catalytic processes; in one alcohol and in the other calcium carbide were the raw materials employed. The former process, suggested by Dr. Perkin, was worked out by Messrs. Joseph Crosfield & Sons, of Warrington; the latter process was the result of experiments conducted at the McGill University of Montreal, and was worked by the Canada Electro Products Co., of Montreal, the calcium carbide being supplied by the Shawinigan Water and Power Co. Acetone was successfully produced by both these firms, but when the requirements of acetic acid for aeronautical purposes became very large it was necessary to stop the process, which was a three-stage one, at the second or acetic acid stage to provide the necessary quantities. Yet another process for the manufacture of acetone was that known as the Weizmann process. In the spring of 1915, Dr. C. Weizmann, of Manchester University, brought to the notice of the Admiralty his laboratory experiments on the production of acetone by bacterial fermentation from maize or other substances containing starch. Steps were taken to carry out large-scale experiments on the Weizmann process, for which purpose semi-manufacturing scale plant was fitted up at Messrs. J. & W. Nicholson's Distillery at Bromley-at-Bow, and at the same time arrangements were made to carry on research work under Dr. Weizmann at the Lister Institute. The Lister Institute research work and the experiments at Messrs. Nicholson's Distillery, which were conducted on a gradually increasing scale, proved that the process, if carried on under proper conditions, would produce acetone on a manufacturing scale, and it was decided by the Admiralty to erect a plant at the Royal Naval Cordite Factory for the production of acetone by this process. The factory was duly completed and acetone was made very satisfactorily so long as raw materials were available; damaged rice was mainly used.

The results obtained during the war, especially in Canada and the United States, have proved that acetone can be produced successfully on a large manufacturing scale by the fermentation of substances containing starch. The process cannot, however, be considered as a commercial one likely of being capable of competing with the production of acetone by the destructive distillation of wood, because of the relatively high cost of the

raw material and the fact that the production of every part of acetone involves the production of two parts of butyl alcohol having very little value for industrial purposes.

Acetone Fermentation Process

In the course of a paper on "The Acetone Fermentation Process and its Technical Applications," Mr. Amos Gill described at length the Weizmann process. From the point of view of academic research, he said, there was yet to be settled the question of exactly what happens during the fermentation. It was probable that the maximum acidity was produced by a mixture of acids rather than by a single one, because it could not be completely neutralised by the addition of milk of lime, and the question arose whether some interaction took place between these acids, the proteins, and the starch present. It was not yet clear what part was played by the actual bacteria and what part by the enzymes present. Certainly the reactions were of a complex nature, but if throughly investigated the knowledge gained might be of considerable utility in the working of the process. The starting point in this work would be the indentification of the acids formed during the early part of the fermentation.

From the purely practical point of view the chief field for investigation was the utilisation of the waste products. Another problem for the technical investigators was the utilisation of the waste gases produced. The first suggestion usually offered was to burn the gases under the boilers and so save fuel. Another suggestion was to use the waste gases in a gas engine.

Another point was the disposal of the butyl alcohol. There is in existence a process, patented by the Synthetic Products Company, for the conversion of this into synthetic rubber, but they have their own source of supply for butyl alcohol.

The working of this process in this country was always carried out under the disadvantage of the comparatively high price of raw material. The only available materials in Britain are potatoes and horse-chestnuts. Both have disadvantages. In foreign countries the raw material can be grown cheaply and bought on the spot. It therefore seems that the future of the Weizmann process lies abroad rather than at home, although, from the pure research point of view, much might be attained in the laboratories at home.

Professor Fernbach Explains and Protests

Professor FERNBACH, of the Pasteur Institute, said he need not make an apology for addressing the meeting, as it appeared to be admitted in this country as well as abroad that he was the discoverer of the fermentation process by which acetone and butyl alcohol were obtained as early as 1910 from a starchy raw material and other carbo-hydrates. Two papers had been published recently, one in America, which referred to the process as Fernbach's process, and the other in the last issue of the *Journal of the Chemical Society*, covering the same ground, had not omitted all information of his work. He thought, therefore, he was entitled to say something on the question; the more so as many misleading and incorrect statements had been published which he wished to put right.

In the first place, it appeared that Sir Frederick Nathan had not been informed by Dr. Weizmann that it was in his (the speaker's) laboratory that Dr. Weizmann was taught in 1910 and 1911, under strict confidential conditions, how acetone and butyl alcohol were produced in the fermentation of maize and other subtsances containing starch, in the proportions approximately of one part of acetone to two of butyl alcohol. Those facts were in close relation to the question of the raw material employed in the Fernbach process, a question concerning which incorrect statements had been made, because as early as 1911 fermentations were successfully carried out with maize, potatoes and glucose at an experimental factory in this country. It was, therefore, misleading to say that in their processes the Synthetic Products Company had never employed anything but potatoes. He had also been surprised to read in *a paper by Mr. H. B. Speakman the following sentence: "It was due to the diligent and original work of Fernbach that advantage was taken of what had long been known to students of general bacteriology, namely, that certain species or strains of one species of organisms are able to decompose carbohydrates with the production of acetone and various alcohols in acids." It was true that one process of fermentation was known in which small amounts of acetone were produced, and others in which butyl alcohol was obtained, but at the time of his work no process was known in which acetone and butyl alcohol were obtained simultaneously in one fermentation. That half truth appeared to be the general rule adopted in some of the papers published.

* A paper by H. B. Speakman on "The Production of Acetone and Butyl Alcohol by a bacteriological process" (Journal S. C. I., June 30 1919, p. 155T).

The King's Lynn Experiments

Among the statements made by Sir Frederick Nathan there was one which to a certain extent was correct, namely, when he mentioned that potatoes were the raw material employed by the Synthetic Products Company at King's Lynn, but he should have added that potatoes were at that time the cheapest raw material available in England. He could support Sir Frederick Nathan when he said that the Weizmann process was very generally similar to his (the speaker's) own, or to the one that was practised at the King's Lynn factory. He would even go further in saying that the processes were identical. It would be very interesting to know on what evidence the assertion that the bacteria were different was based. It might be wondered why the points he had mentioned had not been published earlier by himself. Had that been done it would have avoided a great deal of discussion, and of mischief, both from the practical and from the scientific standpoints. He was not responsible for that. Some members of the Society could bring evidence that he was asked in 1916 to read a paper on the production of acetone by fermentation before the London Section, and that it was formally vetoed by British Government officials. It would have been an anti-patriotic attitude if he, as a citizen of the French Republic, had not accepted that decision, and had done anything which appeared objectionable to the Governnent authorities of an allied nation; and therefore he had kept his mouth closed. It was with the same spirit of loyalty that he deliberately left it to others to qualify the procedure adopted by those officials who superintended the extraction, of all possible useful information from himself and from his friends of the Synthetic Products Company, and who now employed that information without any mention of its origin and took it to their own credit.

In Mr. Gill's paper there was some ambiguity in explaining things, which he would illustrate by one instance. The plant that had been worked at King's Lynn was described at length, and finally reported to be an ideal one. Would it not have been fair, and would it not have been simple justice, to say what parts of the plant erected by his friends had been maintained, and what parts had to be altered, and thus give an idea of the share those friends deserved in such a laudatory appreciation? He thought the meeting would not pardon him if he limited himself to a formal protest against the policy tending to produce the impression that what they had done was very little, and that Sir Frederick Nathan and his colleagues had done all.

Should some further argument be required to justify his protest, he would mention the fact that the success of the so-called Weizmann process dated from the time that the King's Lynn factory was taken over from the Government after having been worked with complete success by the Synthetic Products Company. In so far as fermentation operations were concerned the failure to produce acetone in any quantity, as was stated by Sir Frederick Nathan, was entirely due to incomplete and inadequate plant for distillation, of which fact Sir Frederick Nathan was well aware. Immediately that defect was remedied the plant was worked at full output with complete success by the staff of the Synthetic Products Company. The reasons for that success was mainly that the King's Lynn factory possessed a plant which had been specially designed for the working of the process, and the perfection of the plant so aptly described as ideal by Mr. Gill was demonstrated by the fact that most of the drawings which accompanied Mr. Speakman's paper concerning the plant employed at Toronto reproduced with complete accuracy the details worked out by the Synthetic Products Company.

Processes in French Factories

He was glad to be able to furnish some further information concerning the working of the process in French factories. He was approached by two large distilling firms, one having its works in France and the other in Indo-China, both possessing a plant which could, without any appreciable alteration, be employed for the manufacture of acetone. Those plants had been employed in the first years of the war and previous to the war for the manufacture of silent spirit by a certain process. The experience gathered by those manufacturers in the production of pure alcoholic fermentations greatly helped them in obtaining full success in the manufacture of acetone. The Indo-China works were unfortunately compelled to stop after a few weeks of successful working, owing to the fact that through want of freight they found it impossible to ship their goods to France; but the works in France had been manufacturing acetone continuously since 1907, and had been only stopped recently through lack of raw material. It might be interesting to know that the fermenting tanks, which were iron tanks and which had an average capacity of 16,000 to 18,000 gallons, were charged with a mash containing about 8 per cent. of maize or rice—which was a little above what Mr. Gill had mentioned—which was inoculated with the pure culture content in a 2-litre glass flask, and the average duration of the fermentation had been 40 to 42 hours. Experience had taught exactly what the practice of alcohol manufacture had shown, namely, that the most perfectly erected lines of pipes would not always avoid infection, and that the best means of obtaining the desired result was to dispense with the seed tank, and to see that the fermenting tank had a pure culture prepared in the laboratory.

There were many other things that could be said concerning the question, but he did not think that meeting was the most suitable

place for such a discussion, and he had therefore limited himself to questions raised in the papers that had been read.

Tributes to Professor Fernbach

Mr. GRANT HOOPER said he happened to be Chairman of the London Section of the Society of Chemical Industry at the time that a paper was read on the Synthetic Products Company, and might add a word or two by way of mollifying the feeling which he feared Professor Fernbach held with regard to his position in the matter. At that time Professor Fernbach's name was the only name mentioned in connection with a process for the production of acetone and butyl alcohol, and it was therefore very well known, and he was sure there was nobody in England who would deny to him the credit of having been the first to produce butyl alcohol and acetone by a fermenting process. He took it that Sir Frederick Nathan and Mr. Gill would say that the reason why the process had been more recently referred to as the Weizmann process had been due simply to the fact that Weizmann was placed in charge of the production, and they could only speak actually of the products produced under his operating. He thought everyone would agree that it was a most interesting method of production, and they would like to know a little more precisely about the exact causes—as to whether or not it could, under the most favourable conditions, ever compete with acetone derived from the destructive distillation of wood. It seemed a little remarkable that the production of acetone from acetic acid produced by alcoholic fermentation should not have been successful. He had listened to the figures which had been given, and he concluded that the highest strength mash used in the process was about 6 per cent., which would mean a specific gravity of about 1030. In alcoholic fermentation they managed to work a mash of appreciably higher gravity than that, and it was well known that they succeeded in getting it down until practically the whole of the solid matter disappeared. In the present case the whole of the matter was converted into alcohol, and it had to be recognised that the alcohol would be converted into acetic acid, and it seemed to him a little difficult to understand that it was not possible to produce acetone by the alcohol process at a cheaper rate than it had been produced by the present process. It was said that there was practically no carbo-hydrate remaining, and he was wondering whether there was any dextrine present. He took it that it was not wholly albuminous matter which remained in the unfermented material. Undoubtedly the products of any organism were fatal to the continued existence of that organism. In the present case there was apparently an organism which existed in the presence of such substances as butyl alcohol and acetone.

Horse Chestnuts and Acorns

The Hon. F. R. HENLEY said he had had a certain amount of experience in 1918 with horse chestnuts, and it was found impossible to carry through fermentation with horse chestnut meal unless it was wholly deprived of husk, and that in practice it was impossible to get it to such a percentage that the fermentation would go through properly. But it was found quite possible to have fermentation when the husks were partially removed and the horse chestnut meal was mixed with an equal weight of rice or maize. Under those circumstances at the Royal Naval Cordite Factory they carried through about a dozen fermentations quite successfully, although the fermentation went through a good deal slower than with the cereals alone. Another raw material tried was acorns. Nothing on a large scale was done with that, but quantities were fermented up to about 200 gallons in the same way as horse chestnuts. He believed that the tannin interfered with the fermentation, but with a mixture of 40 per cent. acorn and 60 per cent. rice or maize the fermentation was fairly normal. With regard to the quantity of acetone and butyl alcohol present in the fermenting liquid, and bacteria living in their presence, he did not think that the last speaker had realised the dilution which was being worked. The mash started with 60 or 70 per cent. of grain, and only about 7 per cent. of that was converted into acetone, and 14 per cent. converted into butyl alcohol, so that when the thing was finished there was only 1.4 per cent. of butyl alcohol and .6 per cent. of acetone, which was a very small quantity. There was a good opportunity of following the nature of the gas as there was a plant for separating the gases, and it was found that solution in water under pressure produced a very efficient separation, so that the hydrogen was obtained sufficiently pure to be used by the plumbers. It could have been made sufficiently pure, he believed, for airship work, but apparently it was not required for that purpose. One point that had not been touched upon was the rather interesting developments in elucidating the course of the chemical reactions which took place during fermentation. He would not attempt to explain them as Mr. Gill had explained that the acidity of the mash gradually rose as fermentation progressed. His experience in the factory was that the acidity rose steadily for the first 12 hours, and then fell steadily when the minimum was reached. If that acidity was utilised two acids were produced, butyr acid and acetic acid.

Toronto Experiments

Colonel GOODERHAM said there were several things found in Toronto that might be interesting. He was neither a bacteriologist nor a chemist, but just an ordinary distiller. With regard to the mash, in Toronto they started with 5 per cent. and gradually worked it up to at least 10 per cent. and had the best results at 10 per cent. It was found there that the sluggishness of the ferment was due to using it too soon after it had been put aside for future use. Mr. Speakman, when he came over, brought several tubes with him, and half of them were put on one side and part of the other half was used a year later, and excellent results were obtained, but by using the ferment too soon good results were not obtained, and the ferments were found to be very sluggish. With regard to the inoculating system, they used the pails spoken of by Mr. Gill and nearly all the failures were traced to the aluminium pails. Those pails were discarded and a battery of small inoculators was substituted, which would hold about 5 gallons, and there was a pipe connection from them and on to the seed tanks. Every pipe in the place from the time that it was emptied until it was used again was under steam pressure, and no pipe was allowed to be idle for five minutes. As soon as the ferment went through a pipe distilled water was run through it to wash it out into the next vessel, and then the steam was turned on. They were unfortunate in not having cookers that were built for the purpose; they had to take the yeast tanks from the molasses distillery, and they would only stand 15 lb. pressure. But in the factory he had the pleasure of looking after at Terre Haute there were regular cookers which would stand up to 80 lb. pressure, and they found that they did not increase the yield or do a bit of good, cooking the grain anywhere between 15 lb. and 60 lb., but when over 60 lb. was reached better results were obtained. During fermentation he would take four fermenters and have the whole of the ferment put into the first fermenter, which was filled quarter full, and then go on to the second one and the third and fourth, and then come back again to the first; that took a few hours, but gave the ferment a chance to get started. After that method was adopted there was not a single fermenter that had to go down to the sewer. Fermenters were contaminated to a certain degree, but the yield of acetone was at least 60 per cent. of the normal. If it was 60 per cent. below the normal yield they ran it into the sewer. With regard to the boiler system he could not agree with Mr. Gill as to having three sets of boilers on, because it was really not necessary. It was found in Toronto that they could use the high pressure steam in the pipes to blow through, and there was a reducing valve on which 60 lb. pressure was allowed which kept the pipes sterile. The stills were run with the exhaust steam.

Dr. REILY, of the Royal Naval College Factory, detailed the method adopted at the Royal Naval College Factory, where it was found that the percentage of acetone could be increased by 50 per cent. by the addition of acetic acid.

Sir FREDERICK NATHAN said he would like to endorse the statement by Dr. Grant Hooper that Professor Fernbach was the first to produce a mixture of acetone and butyl alcohol from potatoes. In the very brief sketch contained in his paper he had endeavoured to avoid anything of a controversial nature, and had tried to state as briefly as possible certain facts as far as they concerned the production of acetone in this country and in Canada and the United States during the war: That acetone was produced by means of bacteria which were given to the Department by Dr. Weizmann. He was not prepared to enter into any discussion on the subject; that bacteria were used at King's Lynn and at two distilleries in this country and in Canada and the States, and also used in every case with some form of grain, but not potatoes.

The CHAIRMAN, in according to Sir Frederick Nathan and Mr. Gill the thanks of the meeting for their extremely valuable communications, said he would like to take the opportunity of saying how much pleasure it gave the meeting to have Professor Fernbach present that afternoon, and he wished to assure him how heartily everyone recognised the great and unique value of the contributions which he had made to the subject under discussion.

Institute of Industrial Micro-biology

MR. A. CHASTON CHAPMAN read a paper on "The Employment of Micro-organisms in the service of Industrial Chemistry: a Plea for a National Institute of Industrial Micro-biology."

Mr. Chapman remarked that as a branch of chemical industry industrial micro-biology had not received in this country the amount of attention to which its importance entitled it. As instances he mentioned that whilst alcohol and lactic acid could be prepared synthetically, as the result of various purely chemical processes, those processes were at present so costly and so imperfect as to be useless for technical purposes, and they were therefore largely dependent on what may be termed biological methods for the production of those important substances on a commercial scale. Whether, with the growth of chemical knowledge, the services of the living organism would be ultimately dispensed with or whether—as he thought more probable—those services would be more largely utilised in industrial chemistry, only the future can show. It was sufficient for the present purpose that a number of very important industries were more or less completely dependent upon the activities of certain lowly organisms, and that a very thorough knowledge of the nature of those organisms and of the influence of environment on their chemical activities was essential to efficient and successful factory work.

Facilities, he said, are wanting for the proper training of workers in the biochemical industries, and there are no means by which such workers can keep in touch with modern views and modern developments. There is not, in fact, in this country nor (so far as I am aware) in the British Dominions, any institution devoted to a subject which is admittedly of such enormous technological importance. The first, and perhaps the most important, object of the Institute which I have in my mind would be to provide for the systematic prosecution of original research in connection with all industries in which micro-organisms or enzymes play an important part. That a great deal of very valuable work of this kind has been done in this country is well known to all who are familiar with the subject, but the institutions in which this has been done are scattered, and there can be no doubt that far better results would be obtained if the many closely related problems connected with the activity of micro-organisms and of enzymes could be studied in a single institution adequately provided with all the necessary appliances and specimens, and where the various workers in these closely-associated fields would have the opportunity of discussing their problems with one another. In the next place, the Institute would serve as a centre for the specialised training of men intending to devote themselves to the teaching of micro-biology and bio-chemistry in our Universities and Technical Schools, and also for the practical instruction of factory managers and other technical employees engaged in the various biological industries. A further function which the proposed Institute might fulfil would be that of providing breweries, distilleries, and other factories with any required organisms in pure culture and in sufficiently large quantities for industrial purposes. Then again, the Institute would serve to house as complete a collection of industrial micro-organisms in pure culture as could be got together, and as a central bio-chemical library. At the present time there is happily a proposal to form one large library devoted to chemical literature, and there is a very general feeling that all overlapping and unnecessary multiplication should be avoided. Finally—and this would possibly be not one of the least important of its functions—the proposed Institute would serve as a central home for British micro-biological science.

Discussion

Mr. Brierley said, that at the Newcastle meeting of the British Association, there was a discussion upon the organisation and future progress of the science of mycology, and he was privileged to contribute a paper suggesting the formation of an Imperial Bureau of Mycology, the details of which were close paralleled by those which had been put forward by Mr. Chapman. To the great disappointment of many the British Government, who took up the proposition, did not take it up in its fullest aspects, and although they had acted on it to a certain degree it was only very partial. They had created an Imperial Bureau of Mycology at Kew, but had only in mind the needs of the Colonial mycologists, and not that of industrial mycologists and others. Last November the pathological laboratory at Kew was transferred to the experimental station at Harpenden, where there was being erected a large institute with a mycological department, and it was proposed to establish a laboratory where pure cultures could be retained and supplied. The laboratory was just being inaugurated, and he was asking for help from all those who were interested in the application of pure cultivations of various organisms. Unfortunately, for some time it would be necessary to confine themselves, owing to lack of space and financial assistance, to those organisms which were pathogenic to plants and agriculture, but it was hoped to extend their activities and to include those organisms which were of use in industrial processes, and possibly finally to include a good many of those which were pathogenic to man. It was quite impossible to separate the aspect of a pure culture laboratory into those which had industrial application and those which had agricultural application, and that was also true of the research done at such an institution. It was hoped that industrial chemists who use micro-organisms in their processes, if they created any kind of institute for industrial processes, would work in very close connection with those who were engaged on the more purely agricultural or botanical side, and it would be quite feasible, by a slight extension of the laboratories at Rothampstead, to satisfy the demands of industrial chemists and workers in other branches for the supply of micro-organisms. There was an Association of Applied Biologists where chemists might meet the great bulk of workers in this country who were interested in the industrial biological processes, and might have joint meetings with that body. If the idea put forward by Mr. Chapman met with general approval it should be carried out on a first-class scale, and if it came into operation the biologists of the country would give it the very greatest welcome, and help in every way in the supply of cultures.

Mr. F. J. Lloyd said, that during the last twenty-five years, the number of men who had taken an interest in the study of micro-biology, especially from the industrial point of view, had been very great, and it was surprising that no society had been formed where men could meet and compare notes. If such a society had existed the excellent views put forward by Mr. Chapman could have been more easily carried out. The desirability of such an institute was not only for the supply of organisms, but for the discovery of the source and origin of undesirable organisms, and the institute would be of immense value to the industry, and repay any money spent on its maintenance. There was a considerable difficulty in carrying on pure cultures for any length of time. In some industries, pure cultures were frequently required. For instance, in connection with the fermentation of fruits, the season lasted only for a short time, and pure cultures had to be kept practically nine months, in order to be utilised at the next season, and it had been found necessary abroad to place institutes where pure cultures were manufactured on a large scale at high altitudes to prevent contamination. Several British research associations had been formed recently by those interested in certain industries. Many industries interested could combine to form an association and start research work.

The Chairman said, the communication by Mr. Chaston Chapman was a very valuable one, and a strong case had been made out, and it was hoped that the paper would bear fruit. The suggestion made by Mr. Lloyd was an extemely good one. There was now a department for the advancement of scientific and industrial research in connection with which various associations had been formed for the advancement of branches of particular industry, and he saw no reason why an association should not be formed in connection with that department for the objects which Mr. Chapman had put forward. The suggestion was well worth keeping in mind, and probably at a very early date it might lead to some practical result. On behalf of the meeting he wished to thank Mr. Chapman for his paper.

A vote of thanks was accorded to the Chairman on the proposition of Sir Frederick Nathan.

Electrical Supply in Chemical Works

For the conference on "Power Plant in Chemical Works," held in the Salters' Hall on Wednesday, July 16, a paper was prepared, but not read, by Mr. H. Martin, on "Electrical Supply in a Chemical Works."

Mr. Martin, in his paper, stated that, in taking up chemical engineering work in this country early in the war on his return from abroad, he was astonished to find the backward state of engineering development, particularly on the electrical side. Fortunately, advancement since then had been rapid and the present position, as the result of chemical engineering advancement during the past four years, showed a very creditable amount of progress. The utmost possible use should be made of electricity in chemical works in general, as a means of transforming and distributing energy. He doubted whether in any other industry the use of electricity was of greater value and importance. While appreciating the advantage of standardization in general, the chemical industry called for specialization in the types of electrical plant supplied by manufacturers. On account of the cost of generation it could not be claimed yet that electricity should be practically the only form in which energy was distributed in a chemical factory. In this country at present by far the greater portion of the electrical power used in chemical factories went to supply electric motors, as in most other factories and works. Few other factories, however, need the variety of types of motor required in chemical factories. He anticipated a rapid development in the chemical industry here, of electrolytic, electrothermic, and other processes, absorbing large quantities of electrical energy, in forms very different from that motor power. One question which had caused a considerable amount of discussion in other directions was that of alternating *versus* direct current supply. His own view was that as the average chemical factory was a distinctly unsuitable place in which to have a motor commutator with accessory brush gear, and where even slip rings and their accessories should be avoided, an alternating current system should generally be the type installed. Further, for other reasons, a 3-phase alternating current system, both for generation and supply, would be the kind generally selected.

The question of the periodicity of the plant was not one that called for lengthy consideration. The standardisation of frequency was one of the most important questions before the electrical world to-day, but in the chemical industry, except in special processes, the frequency or periodicity should be such as to enable suitable standard plant to be obtained, with due respect for the power and lighting requirements of the factory. For chemical factories in general a frequency of 50 per second should be very suitable. The question of motor-starters and accessory switch gear was an important one. Push-button and other forms of remote control were rapidly coming into use for motor and other kinds of electrical plant, simplifying the normal operation of such plant, and protecting and prolonging the life of both motor and switch gear. In chemical works, such control systems also facilitated the installation of completely enclosed, dust-proof, and fume-tight starting and control apparatus, which were absolutely essential, not only in explosives, but in many, if not most other chemical factories. An examination of the whole problem would convince them of the necessity for the greatest possible care and the very best advice in preparing for or modernising the electrical supply of the majority of chemical factories.

Chemical Science and Industry

To the Editor of THE CHEMICAL AGE.

SIR,—There is certainly room for your new Journal if run on modern and up-to-date lines, and I for one welcome its advent. The application of chemical science to trade industries advanced before the war in countries abroad far in excess of Great Britain. Years ago, when I studied chemistry under Doctors Stenhouse, Frankland, and A. Hofmann, it was considered unscientific to patent an invention or to connect one's self (as a man of science) with any manufacturing concern. All this is a thing of the past. The chemist in former years knew very little or nothing of economics or business methods so essential to run a commercial concern with success. I quite agree with Dr. Carpenter, of the South Metropolitan Gas Company, that this country has produced chemists of high standing, but they and chemical science generally have never received any encouragement from British Governments, and what has been achieved as a nation has been due entirely to private enterprise. The rule of thumb method used by so many of our manufacturing concerns must (if we wish to keep abreast of foreign competition) give way to correct scientific methods by which alone mistakes are avoided. Applied chemistry is wanted. Advocate it in your columns, and the success of your paper will, I feel sure, be achieved.—Yours, &c.,

R. H. SMITH.

Apsley House, Sheffield,
July 15th, 1919.

The Importation of Chemicals

To the Editor of THE CHEMICAL AGE.

SIR,—The enclosed circular refers to the Proclamation issued by the Board of Trade, Import Restrictions Department, on June 27 last, prohibiting the import of chemicals into the United Kingdom except under licence. This Association, representing by its membership, every branch of the chemical and allied trades, including manufacturers, merchants, importers, exporters, agents and consumers, has been permitted to nominate a representative to the Advisory Committee, which is assisting the Department in connection with the issue of licences to import chemicals. Mr. William Mann, the President, has been elected by the General Committee to represent the Association. I venture to suggest that this matter would prove of interest to the trade in general, and should feel obliged if you could mention the main points in the columns of your valued paper. Thanking you in anticipation, Yours, &c.,

S. J. C. MASON, Hon. Secretary.

British Chemical Trades Association,
80, Fenchurch Street, E.C. 3,
July, 22, 1919.

[*Copy of Memorandum.*]

THE BRITISH CHEMICAL TRADES ASSOCIATION.

In reply to our application the Board of Trade, Department of Import Restrictions, has agreed to this Association being represented on the Advisory Committee which is assisting the Department in connection with the issue of licences to import chemicals. Mr. William Mann, the President, has been elected by the General Committee to represent the Association. Members are invited to advise the Association of the chemicals which they are likely to wish to import. Members who at any time feel that they have cause for legitimate complaint in connection with licensing restrictions should at once bring the matter to the notice of the Association.

German or French Potash for England

To the Editor of THE CHEMICAL AGE.

SIR,—With the lowering of the walls which for years past have prevented us from obtaining a proper view of our neighbours and the conditions in which they are living and working, the general public is at least given a chance of sharing in the knowledge which had only been possessed by insiders. This applies especially to a raw material which has of late roused the keenest interest among various classes of the community.

Potash is a material on which the fertility of the soil as well as a good many industries depend to a large extent, and it is not surprising that under these circumstances Parliament should also have wished to ascertain certain details of a contract for many thousands of tons of pure potash which the German Government was supposed to have concluded with England. But the only information vouchsafed was that certain negotiations for such a contract were being carried on between the two Governments, and though the ministerial reply seemed to convey that the contract was on the point of being put through, a further inquiry as to the price which the English Government would have to pay for such a very large quantity of German potash elicited no precise reply. The ordinary business man drawing the logical conclusion would most probably say that the price to be paid could not be very satisfactory as otherwise there would have been no reason for official secrecy. People connected with the potash industry were able to make a very shrewd guess as to the grounds on which it was thought expedient not to throw light on a question in which the future cost of home grown food was involved.

All is well-known, there are to-day only two sources from which potash can be drawn in practically unlimited quantities: Germany and France, or to be more precise, Stassfurth and Alsace. The Alsatian deposits had not suffered greatly from the war. The German Military Administration had intended to destroy their plant, machinery, shafts, galleries, &c., but the Armistice put an end to Hindenburg's amiable intentions, and it was, therefore, reasonable to assume that given two sources of supply, anyone in need of potash would make careful enquiries on the spot as to the merits and capabilities of the two rivals. If the inquirer was an Ally he would quite naturally wish France to have the benefit of his custom, at least if terms were equal or nearly so. A careful inquiry would have led to the astonishing result that the Alsatian mines were not only able to satisfy the demands of France and all her Allies but to supply the goods cheaper and better. The late German owners of the Alsatian mines were fully aware of these (to them) unpleasant facts, but no one will blame them that they did not give them a wide publicity when the Kali Syndicate was approached with a view to obtaining their quotations for a very liberal supply of fertiliser. The usual business rule is: the larger the quantity the lower the price, but the said syndicate or their accredited representatives succeeded in adducing many reasons why this rule should be reversed. It pointed out that cheap German potash was a pre-war article which had not survived the campaign. Its substitute had the same German qualities, but as to price that had to be calculated on an entirely new basis. There had been heavy increases in wages, rolling stock was scarce, and when obtainable three or four times the old cost, coal was at famine prices (Switzerland paid them though she was a neutral), and so on. It was impossible not to believe in the truth of these arguments, some of which apply to nearly every country to-day, and the syndicate really succeeded in its efforts to obtain the highest possible price for which it had been striving so hard.

This victory was announced a short time ago by a German potash magnate, who said with pride that England had at last agreed to taking German potash. The value of the contract amounted to 30 million marks, which is a very fair sum even if all allowance is made for the shrunken level of the mark. Now that the world knows that German potash is again given the hospitality of English soil, German papers are no longer afraid of revealing the truth, a truth which will be rather unpalatable to many. One such paper has just stated that the competition of the Alsatian mines presents the greatest threat to German potash concerns and even to many industries on the right bank of the Rhine based upon them, for Alsatian salts containing 20 per cent. pure potash are produced at about the same cost as German salts yielding only 8-9 per cent. This difference in the cost of production and the quality of the relative salts (the lowest Alsatian salts contains 14 per cent. pure potash) has been long known in this country, and yet instead of buying in the cheapest and best market facility is given to the enemy article. America, which had also been negotiating for the purchase of German potash, seems to have been kept posted about this remarkable difference, for last month it was reported that she had withdrawn her offers, and there is no doubt that Alsace will find a new and important customer for her fertiliser in the United States.

It seems a pity that an opportunity which would have increased France's exports to the economic advantage of England has not been seized, but this only proves that it is necessary that whenever a business contract is planned in official quarters business men should be consulted. These men can always be found and their advice is bound to be of advantage and to lessen the

strain on the nation's purse. In view of the probability that German potash may soon be landed here the latest figures of the French output will be welcome. The average per day is now—

2,250 tons 14 per cent. kainite
1,675 ,, 20 per cent. manure salts
300 ,, 50 to 60 per cent. chloride

Such figures speak for themselves.—Yours, &c.,

A FRENCH READER.

Dyestuffs in War and Peace

IN a leading article on the present position of the British Dyes Industry, the *Times* says :—

DR. HERBERT LEVINSTEIN, technical director of the British Dyestuffs Corporation, in a recent address to the Society of Chemical Industry, laid stress on the military aspect of the manufacture of dyestuffs. We are now familiar with the commercial side of the question. England had allowed a "key" industry to pass into German hands. When the war came, British manufacturers were deprived of the dyes on which our textiles depend, not only cottons and wools, but lace, silk, carpets, linoleum, and a host of minor industries. Mr. RUNCIMAN formed the British Dyestuffs Corporation to relieve the immediate necessities, and the British Government have subscribed nearly two millions of the capital. It has prospered greatly. It now employs close on 7,000 hands and 300 academically trained chemists, and its works cover more than a thousand acres. It has not yet discovered or replaced all the German processes, but it has made substantial progress and is in a fair way to success. But there is much more involved than the creation of a vital industry to break German monopoly. The huge German "combine" known as the I.G., completed in 1915, not as a by-product of the war, but in continuation of a pre-arranged policy, was not only a stupendous machinery for the industries of peace, but a centre of war industries. It produced all the synthetic ammonia required for the production of vast quantities of explosives themselves, and practically the whole of the chemical warfare products used by Germany. The dyestuff plants were extraordinarily adaptable, and nearly every organic product could be manufactured in them. Not only could the normal plant be transformed to the purposes of war, but most of the expenditure was on special war plant of a permanent character erected with a view to commercial "war after the war." Similarly, the trained staffs of research chemists were adapted to direct and improve either the products of war or the products of peace. Unfortunately, there has been less co-ordination in England. Much of the plant created for the purposes of the war is not susceptible of transformation. There was a tendency to keep separate the industrial chemists engaged on dyestuffs from the distinguished academic chemists who worked on poison gases and other special devices. Objection was taken to the manufacture of substances used in chemical warfare by the experienced staff of the makers of dyes. Great and unnecessary dangers were incurred by this lack of co-operation. The situation must be faced. We have reduced the armaments of Germany, but we have left untouched the greatest source of armaments. Unless the dyestuff industry in Great Britain is developed on the widest possible basis, we shall have to face in future not only a continuance of the efforts of a huge German commercial monopoly, but the perpetual menace of another sudden assault on the peace of the world.

A National Nitrate Factory

In a lecture on "Explosives," at the British Scientific Products Exhibition, Central Hall, Westminster, by Mr. James Young, Royal Military Academy, the lecturer said that explosives were equally essential in war and peace. In industry they are substitutes for man-power, and as this has become both scarce and shy, their use in the future is likely to increase. Nitrates are the foundation of all our military and most other explosives, and at present practically all our supplies come from overseas. A great National Nitrate Factory should be established in England without loss of time. We are already behindhand. The Germans made their own nitric acid for use in the war. America has already established a National factory. Experience is necessary, but good returns should be a certainty. There is an enormous demand for nitrates as fertilisers, so the main product could be used for this purpose in peace, and be immediately available in case of war. Such a factory would increase our security and our agricultural prosperity.

The principal object of the recently formed United States Alkali Export Association will be to obtain a reduction of ocean freight rates. It aims to secure the co-operation of every caustic soda and soda ash producer in the United States.

Pacific Phosphate Prospects

English Company's Pioneer Enterprise

AT the annual general meeting of the Pacific Phosphate Co., Ltd., it was decided to pay a final dividend of 7½ per cent. on the ordinary shares, making 10 per cent. for the year, and to carry forward £13,830.

Dealing with the general position of the phosphate trade the chairman (Lord Balfour of Burleigh) referred to the increased land cultivation in this country, and urged the continuance of this policy. Last year, he said, I ventured to urge that jurisdiction over all phosphate deposits within the Empire should be retained by the Imperial authorities in the interest of the component parts of the Empire. I then had particularly in mind the huge phosphate deposits in the Island of Nauru. This Island was a possession of Germany, and its future administration, then in doubt, has been decided at the Peace Conference in Paris. You will have noticed the statement that a mandate in respect of Nauru has been given to the British Empire. Beyond this we have no definite official knowledge as to what may be arranged in regard to this Island, but we hope to be able to say something before long. We, as a company, and our predecessors have been the pioneers of the phosphate industry in the Pacific Ocean. We and they have been at work there for nearly half a century. At one time Nauru and the other island of the Marshall Islands Protectorate were administered on behalf of the German Government by a German South Sea trading company, with which our company made arrangements to search for phosphate in the Protectorate.

Our company discovered the huge phosphate deposits in Nauru, and, through the German trading company, obtained an exclusive concession until the year 2,000 to work the phosphate deposits in Nauru and any other deposits that might be found in the Protectorate. Much has been said about German penetration into British trade and industry, but I venture to say that it will be difficult to find a British parallel to this company's enterprise in securing so valuable a concession from Germany and in developing so important an enterprise on German territory. About the time that this company discovered the phosphate deposits in Nauru it also discovered the rich deposits in Ocean Island. At the time Ocean Island had not been brought under direct British Rule. At the urgent request, of this company, though I am afraid with some reluctance, the British Government assumed sovereignty over the Island. Our Government granted to us an exclusive concession to work the phosphate deposits there until the year 2,000. For some years the company's operations did not attract much attention. The phosphate industry was not well known in England and did not appeal to the investing public. But German investors realised the importance of the company's undertaking, and in course of time acquired a large holding of shares. That holding was, however, never sufficient materially to influence the policy of the company or to affect its constitution as a British corporation. Soon after the war broke out the directors took every possible step to place the company beyond criticism in regard to these enemy-owned shares, which were in due course put up to auction by the Public Trustee and sold to a British corporation.

When war broke out nearly two-thirds of the white population in Nauru was British and in the employment of the company. Seeing that the only industry in the island had been that of our company, and bearing in mind that the native population has petitioned that the island should remain under British control, I think that we were fully justified in asking that the island should be added to the Gilbert and Ellice Islands Colony, as Ocean Island is now added, and to which, geographically, it should undoubtedly belong. I am aware that there has been a great deal of misapprehension in regard to the Island of Nauru, and I have made these observations for the purpose of showing that whatever arrangements may be contemplated with regard to its future this company has rights which are definite and inviolable. The printed report explains the difficulties with which the company has had to contend during the war, particularly in regard to shipping. The inevitable reduction of output and the general rise in expenses have naturally affected the earnings of the company. The probable release of British tonnage from control and direction at an early date should operate in the direction of a largely increased output at the islands. The universal increase in the demand for phosphate will assuredly bring about large developments of trade in the Ocean Island and Nauru product.

South American Nitrate Industry

Alianza Company's Record Profit

At the annual general meeting of the Alianza Co., Ltd., a final dividend was declared of 20 per cent., making 40 per cent. for the year, and it was decided to carry forward nearly £300,000. The net profit of £261,388 in 1917 was the largest in the history of the company, and in 1918 this was increased to £363,961.

Discussing the immediate prospects of the nitrate industry, the Chairman (the Hon. H C. Gibbs) expressed the belief that it was impossible for anyone to give a trustworthy opinion. We know, he said, that at the moment there are considerable stocks in the consuming countries and that the stocks in Chile which are increasing every day, already amount to about one and a-half million tons; we know also that, owing to the scarcity of tonnage, no appreciable quantity of nitrate is being shipped-and no one can say when tonnage will be available for the full resumption of shipments—and not much more than eight months are left in which nitrate can be shipped for next season. Then even if we assume that sufficient tonnage will be available to lift the nitrate it is not absolutely certain that the consumers will take it. It is true, of course, that there is a strong demand for the small amount of nitrate which is available, but it is the opinion of some that the financial aftermath of the war will check any great consumption of nitrate in Europe during next season, and that we shall have to wait for the season of 1921 before normal conditions are restored. For my part, though I do not take at all a sanguine view of next season's consumption, I am inclined to think that the only check to it will be the shortage of tonnage, but I fear that, from all appearances, this will prove a most serious hindrance to the industry.

We had an extraordinary general meeting on Sept. 19, last, at which we passed a resolution altering the articles of association with a view to placing the control of the company in the hands of a local board in Chile as from Jan. 1, last. This course was adopted to protect our foreign shareholders from British taxation, and the levy of income-tax upon depreciation funds. I, among others, gave evidence before the Royal Commission on Income Tax a short time ago on this latter question, and I gave this company as an example of the bad effect produced by the refusal on the part of the British administration to allow the deduction of the cost of raw material from gross revenue for the purpose of income tax. This matter is now of no particular interest to the shareholders of this company, but it may be of general interest to British nitrate producers to know that the Royal Commission have been thoroughly informed as to the position.

The Chairman, in reply to Mr. H. A. Begg, said the head office of the company had not been removed to Chile but the control of the company was now in the hands of the local board in Chile. The relations of the Alianza Company with the Chilean Government were perfectly satisfactory.

Mr. Begg.—Are the German nitrate companies getting any advantage over the English companies?

The Chairman, no, I do not think so. The whole position was rather obscure until lately, but I think the committee here have received assurances that make it all perfectly right.

W. J. Bush and Co., Ltd.

Success Dependent on Research and Technical Chemists

At the annual general meeting of the Company a final dividend was declared of 15 per cent., making 20 per cent. for the year.

After announcing the election of Dr. Farmer as a director in the place of Mr. Robert Wigram, and reporting that the Company, without drawing on reserve or decreasing dividends, had written off the whole of their assets in Russia, the chairman (Mr. J. M. Bush) said their attitude towards the future was optimistic. We have recently purchased, he said, property adjoining our Ash Grove premises, and already have important extensions under construction; we have also much plant on order. These outlays are being incurred at a time when prices are exceedingly high, and when, in view of the increase in the cost of coal, labour, raw materials, freight, packages, etc., there is some uncertainty as to the extent to which we may be able to meet foreign competition. Some people may think it would have been more prudent to have awaited a definite declaration on the part of the Government of their economic policy before taking active steps, but life is too short for that; besides, it is against the temperament of your directors to adopt the policy of "wait and see." We have not committed ourselves beyond our resources, and I think commercial men should make every effort, and take some risks, in the endeavour to create national wealth commensurate with the liabilities incurred by the country during the war. It need hardly be said that for the fulfilment of our aims much will depend upon the success of the work of our research and technical chemists and the hearty co-operation of all the other employees of the Company.

The recent increase in the spirit duty, up to a total of 51s. 6d. per proof gallon, will put essence manufacturers in this country in a most disadvantageous position as compared with their foreign competitors. As soon as freight facilities are restored, British manufacturers are almost certain to find that much of their export trade is lost, and the high prices are also likely to cause a smaller demand in the home market. Especially will this be the case in essences in which ethyl compounds are used, which have to be made with duty-paid spirits, and on which no drawback is allowed. For example, ethyl acetate and ethyl butyrate sell in the United States at one-eighth the price they cost to manufacture in this country at the present rate of duty. Obviously, the remedy is to pay drawback on these compounds, and it is difficult to see the point of view of the Government in refusing so reasonable a request. This situation has been pointed out to the Government by the British Essence Manufacturers' Association, and the suggestion put forward that some differentiation of duty should be made between spirit used for potable purposes and that used in other food industries. These representations, however, have so far been in vain.

All our foreign branches and subsidiary companies, with the exception of Russia, have had a successful year's trading. The double Income Tax and Excess Profits Duties which we have to pay leave very little reward for one's labour and risk, and unless some speedy alteration is made fresh enterprise will be discouraged. We note with pleasure that these double taxes are receiving the attention of the Federation of British Industries who are going to give evidence before the Government Enquiry Committee.

Assam Oil Company

At the Twenty-first Ordinary General Meeting of the Company the Chairman expressed great regret at the loss which all connected with the company had sustained by the death of Sir Boverton Redwood, who had been their technical adviser from the formation of the company, and by the death of Sir Frank Crisp, their solicitor. Dealing with the results of the past year's trading, he stated that the production of crude oil had been rather smaller than in 1917, their wages and salaries had been higher, and their stores had cost more. On the other hand the prices of all their products had been quite satisfactory, being as good or better than those of the previous year. Throughout the period a good deal of difficulty had been experienced in shipping wax, their income from which now averaged over £30,000 a year. He was glad to say that shipping was becoming more available. As regarded the cash position of the company, the total was almost the same as in 1917. The only change was that in that year they had £21,000 in cash and £42,000 in Treasury Bills and War Bonds, whereas on December 31 last they had practically £10,000 in cash and £54,000 invested in war stocks and bonds. Now that things were settling down, they hoped to push on a vigorous policy in Assam and to do good work in the coming winter. The directors had felt that the geological department of the company required strengthening, and they had been fortunate enough to secure the services of Mr. T. R. H. Garrett as their chief geologist.

The directors were calmly hopeful about the future of the company. Their main field was in good condition, they hoped to push on energetically with all the testings and explorings, and with a continuation of good markets, which seemed to him to be quite probable for a little time to come, the results of their working in the future should be satisfactory. But for the excess profits tax they would have been able during the last two years to pay a dividend of 12 per cent. or 13 per cent. He hoped to go to Assam in the cold weather, and he was looking forward to visiting the company's property. They proposed to pay a dividend of 8 per cent. on the Ordinary shares, and an

additional 1 per cent. on the Preference shares, both less income-tax, leaving a balance to carry forward of £28,322, out of which the excess profits tax in respect of the 1918 accounts would be paid.

Control of Dye Imports

THE Board of Trade (a correspondent writes) has formed a new department, which is known as the Central Importing Agency, and has its offices at 46, St. Mary Axe. The prime motive in instituting this agency is to safeguard the British Dye Industry as much as possible, without causing hindrance to those manufactures in this country which need dyestuffs not produced here at present. A general licence was issued at first, allowing the importation of all dyestuffs of French, Swiss or American origin, but this was stopped on April 9, and since then licences have been necessary for the importation of all dyestuffs into this country, whatever their origin. The regulation of the import of dyestuffs was at first necessary to prevent German dyestuffs from having a free market in this country; but to ensure that the scheme would be efficient, it was deemed necessary to have control over all the imports into this country.

The Central Importing Agency will, as soon as the Trading with the Enemy Regulations have been withdrawn, be the medium through which manufacturers in this country will be enabled to purchase German dyes. Only those dyes not manufactured in this country will be imported into our markets, no matter whence they come. It is hoped by the Agency that within ten years there will be no need for the existence of this Department, as the policy is as soon as we produce a dye, which is on the list of those dyestuffs which can be imported into this country, to remove it automatically from that list. So that the abolition of this Agency would mean that we were self-supporting in this industry.

There are many difficulties in the path of this Department, such as the alteration of names and minor constituents of dyestuffs already manufactured here, with a view to their being placed under their new name, on the Importing List, and finding a ready market by reason of their cheapness. This will mean an immense amount of work for the Central Importing Agency's analytical chemists, as there is little doubt that such attempts to place on the market dyes already manufactured here will be made.

British and German Chemists

A "Times" Opinion

BRITISH chemists shared largely in the labours and successes of the war. For forty years German science had been tuned to the impending struggle, and when the Day came no transformation was needed. The loss of German products arrested the course of British industry. The huge plants of the German chemical manufacturers made explosives in prodigious quantities and added poison gas to the horrors of war. In five years British chemists and chemical manufacturers beat the Germans at their own game. We had the quality and rapidly achieved the quantity. German products were replaced; poison gases were distilled from an even deeper abyss of hell. The president of the Society of Chemical Industry was justified in claiming that it was a chemists' war and a chemists' victory. So it was, just as it was a soldiers' war and an engineers' war, and a war and victory of every activity in our Empire. Professor Louis rightly insisted that recent history had not supported those who clamoured for the reconstruction of British scientific education on the German model. Many things we can learn from Germany, but chiefly in the direction of a greater public belief in science and care for science than in the form of the methods by which science is to be advanced. The good seed is already here; it needs more solicitous cultivation, more abundant manuring. During the war there was plenty of both. The country required chemistry and was willing to pay for it. It got what it required. Our need of research in chemistry and of applied chemistry is even greater in peace than in war. We can get them if we will pay for them.

German Chemical Research in Explosives

THE war (the *Technische Blatt* states) gave a powerful impulse to chemical research in explosive substances and combinations, with the result that several new explosives of great power were adopted to meet new requirements. Some of these will remain for use in the mining industry and the excavation work of engineering undertakings. The tendency is to get stronger explosives, with a view to lessen manual labour. Progress seems to lie in the direction of using ozone as the oxidising agent. In the combination of ozone with one of the aromatic series of substances, as, for example, ethyle-ozonide, or benzol-tré-ozonide, the so-called ozo-benzol, it releases enormous explosive energy. One kilogram develops on explosion some 2,000 calories, that is, 500 more than nitro-glycerine. Ozo-benzol not only possesses this enormous energy, but its rate of detonation is exceedingly high, which gives it exceptionally great disruptive power. In this compound, endothermic and exothermic reactions unite to bring about its characteristic shattering effects. Oxygen endowed with endothermic energy in the form of ozone combines with hydrogen, under conditions which give the maximum of power, to form the most violently disruptive explosive yet known. With our present knowledge, however, it is rather an indication of the direction in which an advance may be made than a practically usable explosive. A. Stettbacher, in a recent address to the members of the Swiss Chemical Society at Zurich, directed attention to another substance, chloric acid, which, like ozone, is of an endothermic and oxidising nature, and which, therefore, may find a wider application as the active element in an explosive. According to this authority, glycerine tri-chlorate, a compound of glycerine and chloric acid, liberates more than 3,000 calories—twice as much as nitro-glycerine.

Germany's Bid for Trade

BRITISH manufacturers are finding that the low price of the mark in Germany is an important aid to the German in his new attempt on the world markets. The British pound sterling is to-day worth in Germany at least 70 to 72 marks instead of about 20 marks, its value before the war. As many as 86 marks have been paid for the pound.

The effect of this on German export trade was explained to a representative of *The Daily Mail* by Mr. Guy Locock, of the Federation of British Industry.

"The high rate of exchange in Germany," he said, "makes it difficult for her to buy abroad in competition with ourselves. But when she comes to sell goods made from her own raw material, such as iron, steel, chemicals, and timber, she benefits by the low value of the mark.

"An article which costs 10s., or 35 marks, to produce in England can be produced in Germany at a cost which is still much nearer the old value of 10 marks than the new 35 mark value. There is thus a big margin, and the German, although he has to pay higher wages, new taxation, and higher establishment charges, can cut prices and underquote us.

"The Federation of British Industry is informed that the Germans are actually underbidding English producers in the Dutch market by as much as 40 per cent. They cannot do it in woollen or cotton goods or anything for which they have to import the raw material, but they can do it when dealing with their own raw material.

"This state of things will not last very long. The standard of living in Germany during the war was very low. We believe the German working man will insist upon it being raised and will demand high wages. It is also probable that as soon as Germany resumes her export trade the mark, which stood at 30 to the £1 at the Armistice, will appreciate again."

Natal Sugar Industry

THE sugar growers of Natal and Zululand are already providing the Union of South Africa with the bulk of its needs, and it is safe to say that the development of an export trade will have to be undertaken before long in order to secure a market for surplus production. In August, 1917, there were 161,135 acres planted with cane in Natal and Zululand, and an additional area of 120,000 acres suitable for cane-growing exists, apart from land which is not at present available owing to it being under the control of missions and the Native Trust. The average annual crop is about 10 tons of cane to the acre.

From Week to Week

Lord Eustace Percy has joined the board of the "Shell" Transport and Trading Company.

Mr. T. S. Patterson, lecturer in Organic Chemistry, Glasgow University, has been appointed by the Glasgow University Court to the Gardiner Chair of Organic Chemistry.

Dr. E. P. Cathcart, Professor of Physiology, London Hospital Medical School, has been appointed by the Glasgow University Court to the Gardiner Chair of Physiological Chemistry.

Several thousand pounds worth of damage was done by a fire at Messrs. Bealey's bleaching works at Radcliffe, Manchester, on Monday.

The late Ferdinand Auguste Zimmerman, of Southhill Park, Bromley, senior director of A. and M. Zimmerman, Ltd., chemical agents, has left estate valued at £34,025.

The late Mr. W. J. Maltby, chemist and druggist, of 1, St. Giles Avenue, Lincoln, well known in Masonic circles, only son of the late Alderman Maltby, has left estate valued at £1,136.

Mr. Alfred Wood has been released from the Board of Agriculture in order to devote his entire time to the work of the British Sugar Beet Growers' Society.

Messrs. R. W. Greeff & Co., the well-known London firm, have moved their American offices from 80, Maiden Lane, to 78, Front Street, New York City, where they now occupy a five story building.

The offices of the Imperial Mineral Resources Bureau have been moved from 14, Great Smith Street, to 2, Queen Anne's Gate Buildings, Westminster, S.W. 1.

The fifth International Exhibition of Rubber, other Tropical Products, and Allied Industries will be held at the Royal Agricultural Hall, Islington, from June 3 to June 17 next year. The offices of the exhibition are at 43, Essex Street, Strand.

Owing to his continued ill-health, Mr. Cyril Haslam has been obliged to resign the chairmanship of Joseph Crosfield & Sons, Ltd., soap manufacturers, Warrington. The directors have elected Mr. Giles Hunt in his place.

A Swedish Commission for investigating the quantity of shale oil in Sweden reports that the various shale districts are able to produce 144 million tons of raw mineral oil. Sweden will thus for a long time to come be enabled to meet her requirements of raw oil, about 16,000 tons annually.

Mr. E. Shrapnell Smith, who has completed his voluntary work as Deputy-Director of Technical Investigation in H.M. Petroleum Executive, has accepted a retainer to act as technical adviser to the directors of the National Benzole Company (Limited), in respect of the utilization of benzole as a motor fuel.

Mr. Cyril Rosenbaum, of Tredegar, has obtained the degree of M.Sc., of the University of Wales, which was awarded him in recognition of the special services he rendered during the time he was engaged on important research work at Aberystwyth. Mr. Rosenbaum, who is only twenty-three, has also been admitted an associate of the Institute of Chemistry.

Sir Robert Hadfield mentioned at the annual meeting of the Mond Nickel Company in the Central Hall, on Thursday, that while the King was being shown over the exhibition in that hall on Tuesday he expressed his pleasure at learning that they could now obtain all the nickel that was needed by the Empire within the Empire itself.

Professor Armand Gautier, on Monday, explained to the Academy of Sciences, Paris, the results of his long and patient experiments as to the effect which the chemical fluorine has in the cultivation of the soil. In a field in the soil of which fluorine had been mixed, the wheat crop was 13 per cent. above the average, oats 12 per cent., and potatoes 58 per cent.

Alderman John Slater, chemical manufacturer, Prospect Villas, Blackburn, who was found dead in his bathroom on Wednesday from self-inflicted injuries, was well known throughout Lancashire. He was sixty years of age, and a prominent Conservative. He had served on the Blackburn Town Council for many years. He was a large property owner, a Freemason, and a member of the board of management of an assurance company.

The Duke of Connaught who, together with the Crown Prince of Sweden, visited the British Scientific Products Exhibition, Central Hall, Westminster, on Wednesday, on enquiring into the position of British dyes in comparison with other countries, was told that competition was more likely to come from the United States than from Germany. The United States have now £50,000,000 invested in dye-producing firms, which is equal to the total capital of the chief German firms before the war.

Applications for space in the Exhibition of British Manufactures, to be held at Athens in October, will not be accepted after the end of this month. Altogether about 300 British manufactures will be represented at the Exhibition, including brass and copper tubes, sheets, &c.; essential oils, essences, perfumes, synthetics, fine chemicals; sulphate of copper; lubricating oils and polishes; lead products, paint; tungsten products, and leather goods of all kinds. The value of the exhibits is estimated at from £250,000 to £300,000.

The Director of Industries in Assam, Mr. K. D. Barua, has received inquiries from the United States for tea seed oil, for which he states there is a demand by dealers in vegetable oils. This produce is chiefly exported from China and Japan. The seeds contain from 20 to 25 per cent. of fixed oil of a clear light yellow, non-drying and approaching olive oil in its character, but with a more or less acrid taste. The Chinese have long used this oil for cooking purposes. It serves well as a lamp oil, and produces excellent hard white soap.

An Argentine Decree, dated May 17, provides that the Custom houses of the Republic are not to permit the importation of opium and its preparations, morphine and its salts, and cocaine and its salts, except by druggists and chemists, and with the concurrence of the Department of National Health. The Decree prohibits the sale of the products in question except on written request of a recognised medical authority, and also contains provisions respecting the inspection of chemists' and druggists' stocks and registers of sales.

The King and Queen, accompanied by Prince Henry and Princess Mary, visited the British Scientific Products Exhibition on Tuesday, and were received by Lord Crewe, Sir Richard Gregory (chairman of the Exhibition Committee), Sir Robert Hadfield and Mr. A. A. Campbell Swinton (members of the committee), and Mr. F. S. Spiers (the organising secretary). The visitors showed great interest in the exhibits. On leaving, the King said the visit had been both interesting and instructive. He hoped so valuable a display would prove to be of great practical use in the development of British industry.

Sir Evan Jones, M.P., has found it necessary to resign his position as Commissioner of Dyes under the Board of Trade, in consequence of the heavy duties attaching to the post of Controller of the Coal Mines Department. In future all communications referring to dyes should be addressed to the Assistant Secretary, Industries and Manufactures Department, Board of Trade, Gwydyr House, Whitehall, London, S.W.1. Sir Evan Jones, who became Coal Controller last March, in succession to the late Sir Guy Calthrop, has been Commissioner of Dyes since 1917.

It is proposed to establish a metallurgical exchange at Zurich. The proposal, the *Board of Trade Journal* states, is being put forward by the Société pour Valeurs de Fer et d'Acier, Schaffhouse. It is considered that such an exchange, which would take place regularly every Friday, would give an opportunity to British firms to send a representative to Zurich where he could get into direct touch with buyers in Switzerland in the easiest possible manner. The organisers propose to circularise their intentions by sending the circular to prominent British firms who might be interested.

The Committee of the National Benzol Association have issued the following specification for benzol for use as motor spirit:—(1) Specific gravity, .870 to .885; (2) distillation test (by flask)—benzol shall give a distillate of not less than 75 per cent. to 80 per cent. at 100 deg. C.; (3) sulphur—the total sulphur shall not exceed 0.40 per cent.; (4) the benzol shall be entirely free from water; (5) colour—water white; (6) rectification test—90 c.c. of the sample shaken with 10 c.c. of 90 per cent. sulphuric acid for five minutes should not give more than a light brown colour to the acid layer; (7) benzol shall be entirely free from acids, alkalis, and sulphuretted hydrogren; (8) benzol shall not freeze at 25 deg. F. below the freezing-point of water.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

DRYING. Drying by heat in conjunction with mechanical agitation and spreading. E. A. Alliott. *J.S.C.I.*, July 15, 173-185T. A valuable illustrated paper describing different types of dryers.

EXHIBITION. The British Scientific Products Exhibition. *J.S.C.I.*, July 15, 244R, also *Engineering*, July 18, 73-76.

GERMANY. Industries in the Rhine Provinces. *Chem. Trade J.*, July 19, 66. Report of lecture by W. Hill at a meeting of the National Union of Manufacturers, July 14.

HYDROGEN. Manufacture of hydrogen for aircraft use. *Gas J.*, July 22, 183-184. An account of the "silicol" process.

JAPAN. Trade in Japan. *Board of Trade J.*, July 17, 83-87. Contains notes on the chemical and allied trades.

LITERATURE. Chemical Compendium in the English language. W. P. Wynne. *J.S.C.I.*, July 15, 239R. Notes on the publications proposed by the General Committee of Chemical and Allied Societies.

METALS. Some recent advances in the measurement of hardness in metals. F. C. Thompson. *J.S.C.I.*, July 15, 241-243R.

PATENTS. Prolongation of patents. *J.S.C.I.*, July 15, 243R. Notes on the difficulties relative to extension.

SEPARATION. The separation of solids from liquids. B. G. McLellan. *J.S.C.I.*, 190-192T. Notes on various methods of filtration.

Colonial

BRITISH COLUMBIA. Chemical adventures in British Columbia. J. A. Dawson. *Canadian Chem. J.*, July, 219-222. Address delivered at second Convention of Canadian Chemists, Montreal, May 17, dealing with the possibilities of the chemical industry.

CANADIAN WAR MISSION. The work of the Canadian War Mission at Washington from the standpoint of the chemist. J. W. Bain. *Canadian Chem. J.*, July, 223-227. The work of the Mission dealt with the advancement of Canadian interests in the United States.

GRAPHITE. The graphite situation. H. S. Spence. *Canadian Chem. J.*, July, 213-216. An interesting article on the production of graphite in Canada.

ORGANISATION. Final report of the Chemists' Organisation Committee. *Canadian Chem. J.*, July, 228-229. An outline of a scheme for the organisation of Canadian chemists is given.

SOCIETIES. Notes on the closer working and joint housing of Technical and Scientific Societies on the Rand. P. Cazalet. *J. Chem., Met., and Min. Soc. S. Africa*, May, 228-240. The proposed scheme of co-operation is outlined.

French

ALGERIA. Resources of the French Colonies. I, Algeria (serial). *Rev. Prod. Chim.*, June 30, 309-312. This instalment deals with vegetable products.

BOILER FEED WATERS. Boiler feed waters (serial). J. H. Mathieu. *Rev. Prod. Chim.*, June 30, 311-315. The analysis of purified waters and of natural waters is dealt with.

CAUSTIC SODA. Preparation of caustic soda from permutil, common salt, and limestone. A. Dubosc. *Caoutchouc et Guttapercha*, July 15, 9865-9866.

German

ACIDS. The mineral acid industry in 1917 and 1918. K. Reusch. *Chem. Zeit.*, June 28 and July 5, 390-391, 410-411. These instalments deal with analytical methods and with hydrochloric acid and sulphates.

AMMONIUM SALTS. Simple apparatus for making ammonium salts from gas liquor in small works. *J. Gasbeleucht*, June 14, 328-329.

Works experiences in the manufacture of ammonium sulphate. A. Krämer. *J. Gasbeleucht*, June 21, 344-345.

APPARATUS. The standardisation of laboratory apparatus. J. Datte. *Z. angew. Chem.*, July 1, 207-208.

COBALT-NICKEL ALLOYS. The manufacture of cobalt-nickel alloys. O. Barth. *Metall. und Erz.*, June 23, 267-273. Deals with the manufacture, analysis, and uses of these alloys.

FUEL. The fossil fuels and their utilisation during the years 1914-1918. A. Fürth. *Z. angew. Chem.*, July 1 and 8, 201-207, 209-216. A review of the literature.

The testing of spontaneous combustibility. L. Schaper. *Chem. Zeit.*, July 3, 401-403. Apparatus for testing the liability to spontaneous combustion is described and illustrated.

GAS. The preparation of coal and production of gas. F. Herbst. *J. Gasbeleucht*, June 14, 317-323. Notes on coal washing and screening for gas works.

Production of gas from municipal sewage sludge. M. Hönig. *J. Gasbeleucht*, May 31, 287-289. Conclusion of article previously noted (CHEM. AGE, p. 141).

The double-gas process of Prof. Strache. *J. Gasbeleucht*, June 21, 342-343. Illustrated description of the process.

INDUSTRY. The prospects of the German chemical industry after the war. *Chem. Zeit.*, June 28, 389-390.

IRON. Determination of iron in iron ores by means of permanganate. L. Brandt. *Chem. Zeit.*, July 1, 394-397. Conclusion of article previously noted (CHEM. AGE, p. 141).

NITROGEN COMPOUNDS. Saltpetre, ammonia, and nitric acid. C. Kippenberger. *Ber. deuts. Pharm. Ges.*, 1919, part 5, 391-405. An interesting general article.

PLANT. Chemical apparatus in the United States. *Chem. Zeit.*, June 26, 385. Notes on some war-time developments in the output of plant.

United States

REFRACTORIES. A study of some light-weight clay refractories. M. F. Beecher. *J. Amer. Ceram. Soc.*, May, 336-355. An account of tests with bricks containing sawdust.

ZINC. War's influence on the zinc industry. P. Yeatman. *Eng. and Min. J.*, July 5, 19-21. An address before the American Zinc Institute meeting, St. Louis, June 9.

Miscellaneous

CHROMIUM. New method for the quantitative determination of chromium. A. Terni and P. Malaguti. *Gazz. Chim. Ital.*, July 10, 251-256. A volumetric method applicable to steels is described.

SALT. Extraction of salt from sea water. *Teknisk Ukeblad*, June 18. A description of a new process developed in Norway.

A company has been formed at Wolverhampton, under the title of the Electro-Chemical Developments Company, Ltd., for the purpose of manufacturing a magnesium metal which has hitherto been solely produced in enemy countries. This metal is much lighter than aluminium, and can be used for all purposes for which aluminium is now used, and has a specific gravity of 1.73. The company has purchased land and buildings opposite to the corporation electrical station, from which they will take the power for the manufacture of the metal. The works, which are expected to be completed about August, will be under the management of Mr. Rowatree Hague.

Patent Literature

We publish each week a list of selected specifications as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. Lists of patent applications and of "convention" specifications open to inspection before acceptance are added; abstracts of the latter appear as soon as possible thereafter.

Abstracts of Complete Specifications

112,768. Nickel Catalysers Employed in the Hydrogenation of Fatty Bodies, Regenerating Oxide of. Soc. Industrielle de Produits Chimiques, Paris. International Convention date (France). January 16, 1917.

Spent oxide of nickel catalyser used for the hydrogenation of fatty bodies is treated with solvents such as petrol, benzene, ethylene trichloride, etc., to remove grease, and then heated to incandescence till oxidised to the grey oxide NiO. This is then reduced in a current of hydrogen at 295° C. till about 30—70 per cent. of oxygen is removed, leaving the suboxide which is again used as a catalyser.

128,227. Light Mineral Oils from Heavier Oils, Production of. Sir H. S. Maxim (Executors of). London. Application date, June 15, 1916.

A closed rotatable cylinder is partly filled with heavy oil and finely-divided zinc. Water slightly acidulated but too weak to act on the zinc is added and the mixture then heated up to 300°—400° C., under a pressure of 300—800 lb. per sq. in., while the cylinder is rotated. Under these conditions nascent hydrogen is formed by the action of the acidulated water on the zinc, and acts on the vaporised oil. The resulting lighter oils are drawn off as vapour and condensed, or obtained by subsequent distillation of the contents of the cylinder.

128,239. Solid Paraffins, Treatment of. W. Elborne, Peterborough. Application date, June 16, 1917.

Solid paraffin may be powdered or granulated by subjecting it to a granulating or disintegrating action in the presence of ethyl or methyl alcohol.

128,255. Hydrocarbons, Production of Low-boiling from High-boiling. G. F. Forwood, and J. G. Taplay, London. Application date, July 3, 1917.

A retort is filled with shale and heated so that the bottom is at about 600° C., and the top at about 400° C. Steam is admitted at the top, mixes with the distilled oil vapour, and the mixture passes downwards through the retort. The carbon in the spent shale at the bottom acts on the steam, and the hydrogen liberated hydrogenates the oil vapour. The resulting oils of lower boiling point are extracted at the bottom.

128,273. Hydrogen from Carbon or Carbon-containing Substances by the Action of Water or Water Vapour thereon. H. J. Prins, Zaandam, Holland. Application date, July 9, 1917.

Carbon or carbon-containing substances are mixed with a catalyser consisting of oxygen-containing salts of the alkali or alkaline earth metals (sodium, potassium, barium) or compounds from which such salts are formed, mixed with non-volatile oxides or hydroxides of a weak acid character (oxides of boron, aluminium, silicon, tin, etc.), or compounds from which such oxides are formed. The mixture is heated to 300°—600° C., and a mixture of carbon dioxide and hydrogen is liberated, carbon monoxide being absent. The carbon dioxide may be removed by any known means.

128,326. Mineral Oils, Production of. J. B. Carper, London. Application date, November 7, 1918. *See illustration.*

Spent oils from coal-gas washers, and crude oils such as creosote, naphtha, paraffin, etc., are treated to produce light, medium, or heavy oils free from naphthalene. The oil is first distilled to 325° C. and the distillate agitated in the tank A, by jets of cold air B, with about 1 per cent. of a solution of sulphuric acid of 60° Baumé, then with about 4 per cent. of a solution of 60° Baumé, and then with about 10—12 per cent. of a saturated solution of caustic soda, and finally with about 5 per cent. of soft water. The oil then passes by pipe *a* to the still C provided with a condenser coil *d*, and thence to the three receiving vessels E, E¹, E². The first vessel receives distillate up to 180° C., the second between 180° C. and 225° C., and the third between 225° C. and 360° C., only one being used at a time. The first distillate may be mixed with 25 per cent. of light fuel oil such as benzol or petrol and re-distilled, giving a high-grade motor oil. The second may be used as a paraffin substitute, and the third as a preservative coating. If desired, the distillates may be collected in tanks G, G¹, mixed, and re-distilled. The residue from the still C is collected in the tank F.

128,327. Magnesium Chloride, Preparation of Anhydrous. P. L. Hulin, Grenoble, France. International Convention date (France), January 13, 1917.

Hydrochloric acid gas is formed by the direct union of hydrogen and chlorine in contact with the hydrated magnesium chloride to be treated. The water is expelled from the hydrated chloride by the heat of the reaction and the anhydrous salt preserved by the presence of the hydrochloric acid. The chlorine gas may be in excess, or gaseous hydrochloric acid may be present with the mixture before combination.

128,362. Volatile Liquids, Separating the Constituents of Mixtures of. A. G. Green and Levinstein, Ltd., Manchester. Application date, June 12, 1918. *See illustration.*

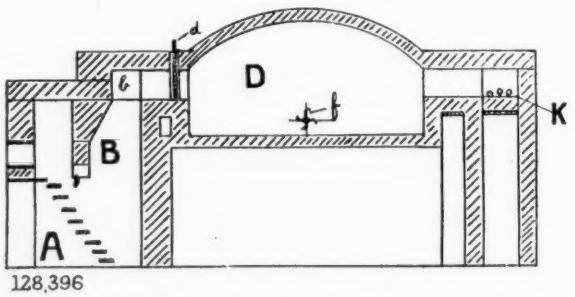
The mixture of volatile liquids passes from the tank *h* by the regulating valve *r* to a "climbing film" evaporator *e*, the tubes of which are heated externally by steam or hot oil to evaporate the low-boiling constituent. The film of liquid overflows into the tube *d* and thence to the tank *j*, while the vapour passes to the condenser *f*. The liquid in the tank passes in a similar manner through a similar evaporator *o*, and the remainder of the low-boiling liquid is evaporated and passes to the condenser *g*. The high-boiling constituent overflows into the tank *m*.

128,375. Furnaces, Gas-Producers and the like. R. Colombo, J. Cazaban, and M. F. Fernandez, Buenos Ayres. Application date, June 17, 1918. *See illustration.*

The body 1 of the furnace is provided with a false bottom 3 and a cover 5 having a central opening controlled by an obturator 6. A perforated tube 4 rests over the opening in the bottom 3 and the space below is controlled by a valve 7 which regulates the supply of air to the fuel 2. The gas generated may be used for heating a superposed container or the like. Larger furnaces may be provided with a number of tubes such as 4.

128,396. Sulphuric and other Acids, Apparatus for the Concentration of. G. K. Davis, London. Application date, June 19, 1918. *See illustration.*

Hot gas from the combustion chamber B of a furnace A passes into a transverse space *b* from which it passes into a series of parallel chambers of which one, D, is shown. The inlet to each



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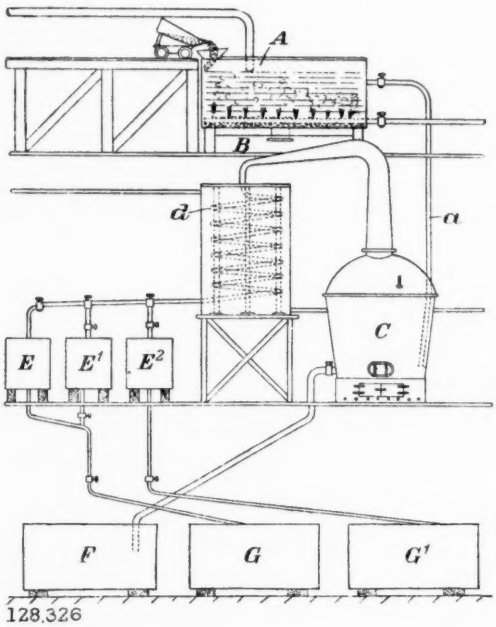
chamber is controlled by a damper *d*. The acid to be concentrated is pre-heated by the exhaust gas in the economiser K and then passes through the series of chambers D in succession. Each chamber is provided with a rotary fan *f* of acid-proof material and the space above the liquid in D is filled with a fine spray of acid which is concentrated by the hot gas. The sub-

division of the concentration process ensures that no saturated gas comes into contact with the acid, and the chambers D are made to conform to the shape of the spray to avoid dead spaces.

128,398. Iron and Steel Plates or Sheets, Pickling. H. S. Thomas, Llandaff, and W. R. Davies, Whitchurch, Glam. Application date, June 20, 1918.

Iron and steel plates which are intended to be tinned are treated with the pickling acid after annealing and rolling in such a way that a greater pickling action takes place at those parts, *e.g.* the marginal parts, where it is most required. This is done by passing the plates between acid tanks provided with spraying jets which are more numerous near the margins of the plates, so that these parts receive more acid.



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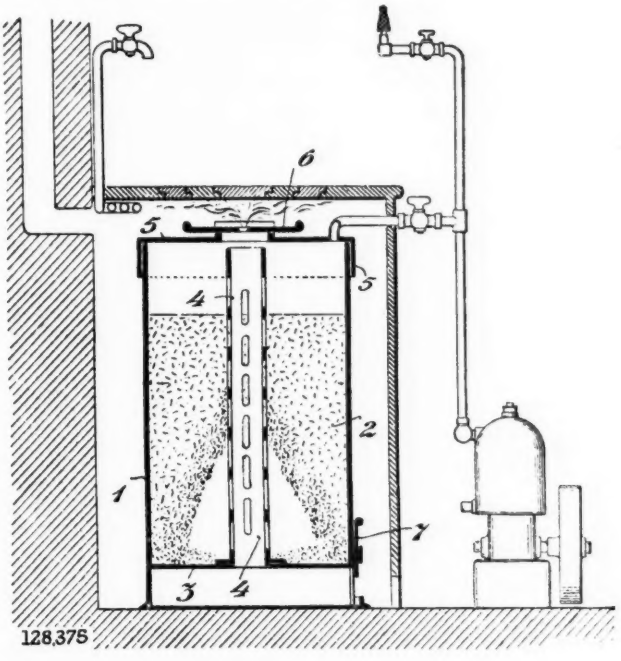

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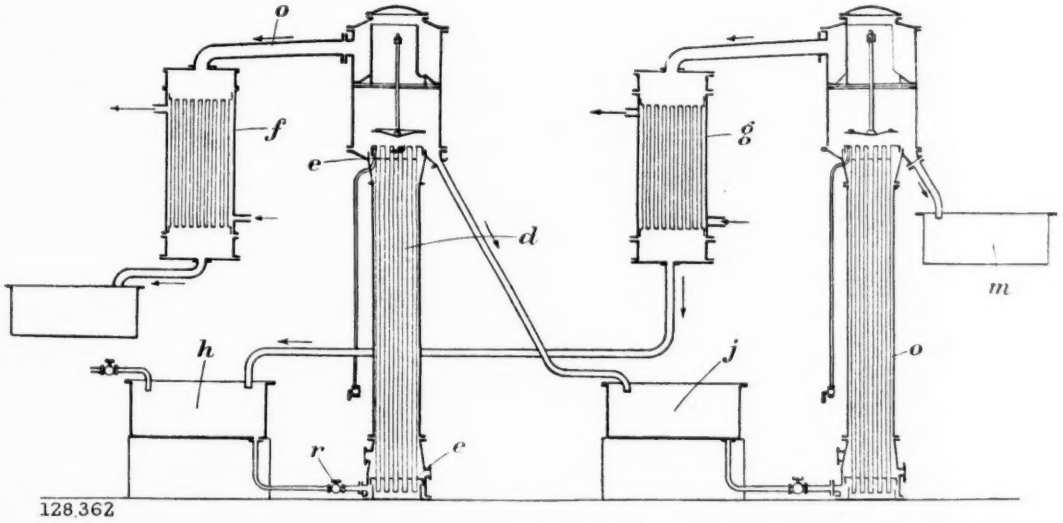

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128,401. Gases from Producers or the like, Treatment of Liquor from Plants for Purifying. D. M. Holmes, Stockton-on-Tees. Application date, June 20, 1918.

The liquor is concentrated in an evaporator to about one quarter of its bulk and then distilled with lime until about 75 per cent. of the ammonia has been recovered. The residue, which is offensive and usually difficult to dispose of, is run into a producer to destroy the organic matter and expel the remainder of the ammonia. In a producer having a water lute, calcium chloride collects in the water, which may be treated with nitre cake or other form of sodium sulphate to produce calcium sulphate and sodium chloride. The latter may be disposed of as an effluent.

128,452. Cement, Non-porous. F. D. Mulligan, Belfast. Application date, July 31, 1918.

Slaked lime is mixed with raw linseed or equivalent oil in the proportions of 20 to 3, and the mixture added to an ordinary mixture of cement and sand in the proportion of 1 to 32. The cement is thereby rendered waterproof.

128,477. Phenol-formaldehyde Condensation Products, Compositions containing. G. L. Scott, London. Application date, September 23, 1918.

A phenol-formaldehyde condensation product is mixed with calcium oxide and used for making moulded articles. India-rubber or other natural gum may be added, and also an inorganic and/or organic filling material, such as fullers' earth, steatite, china-clay, asbestos, wood-flour, meal or pulp, and waste fibrous materials.

128,485. Fuel Briquettes. D. B. Bibb, London. Application date, October 15, 1918.

Fuel briquettes are made by grinding the fuel to approximately uniform consistency and mixing half of it with the binder. The remainder of the fuel is then mixed in, thus producing a briquette of uniform quality throughout.

128,507. Cyanides, Extraction of. W. J. Mellersh-Jackson, London. (*From Air Reduction Co.*) Application date, January 6, 1919.

The cyanide may be produced from a furnace charge of 40 per cent. soda-ash, 50 per cent. coke, and 10 per cent. iron in the form of iron ore or oxide. The mixture is ground and thoroughly mixed and then subjected to the action of nitrogen at 850°—1,100° C. The product is cooled out of contact with air and leached with a mixture of water and an organic solvent such as methyl or ethyl alcohol or acetone. Alkali metal carbonate is relatively insoluble and the hydroxide soluble, but the latter may be converted to carbonate by the action of carbon dioxide at a pressure slightly above atmospheric, excess of carbon dioxide being avoided. By this process the production of ferrocyanide and the hydrolysis of the cyanide is retarded. It may then be extrated without contamination by hydroxide.

International Convention Specifications now Open to Inspection

126,606. India-rubber. J. F. B. van Hasselt, Rotterdam. International Convention date, May 8, 1918.

The vulcanisation of indiarubber is accelerated by the use of double compounds of nitrosodimethylaniline or its homologues with aromatic bases.

126,614. Retort Furnaces. C. H. Smith, Short Hills, New Jersey, U.S.A. International Convention date, May 9, 1918.

Horizontal ovens for the partial carbonisation of coal are made of an inverted heart shape in cross section with a pair of interlocking screw conveyors for the charge, the conveyors being adjustable horizontally and vertically with respect to the retort. The combustion flues are arranged in two independent sets, one on either side, which are separately fired and controlled. The air supply for combustion passes through recuperators. The arrangement of the flues and setting is described in detail.

126,646. Cements and Mortars, Treating. C. Catlett, Staunton, Virginia, U.S.A. International Convention date, May 9, 1918.

100 parts of quicklime are mixed with 60 parts of commercial calcium chloride dissolved in 50 parts of water, giving a dry friable material. The proportion of calcium chloride may be varied, preferably between 25 and 35 per cent. About 1.5 to 5 per cent. of the powder is added to Portland cement or lime concretes, or slaked lime and calcium chloride may be separately added to the Portland cement. Calcium chloride may be used alone in the case of lime mortars.

Latest International Convention Specifications Open to Inspection

129,624. Thorium compounds, Manufacture of. Lindsay Light Co. July 8, 1918.

129,629. Alkali-sulphides or sulpho-silicates from silicates, Production of. E. Bergve. July 8, 1918.

129,637. Ammonia, Pumping the gases intended for the synthetic production of. L'Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procedes. G. Claude. Feb. 15, 1918.

129,648. Liquefied gases, Regulating the operations in rectifiers for rectifying mixtures of. Barbet et Fils et Cie., E. July 9, 1918.

129,649. Glycerine from the weak alcoholic liquors of fermented liquids, Continuous distillation of. Barbet et Fils et Cie., E. July 11, 1918.

Specifications Accepted, with Date of Application

128,623. Pressure furnaces particularly for use in the synthesis of ammonia, Construction of. E. B. Maxted and T. A. Smith. August 14, 1917.

128,640. Volatile solvents used in manufacture, Process for the recovery of. J. H. Bregeat. May 25, 1917.

128,660. Carbonaceous materials, Destructive distillation of—to increase the aromatic by-products thereof. F. M. Perkin, and Nitrogen Products and Carbide Co. August 28, 1917.

128,676. Zinc, copper, or other metals. Soc. de Metallurgie Electrolytique. October 28, 1916.

128,687. Lactic acid and its salts, and the recovery of the volatile fatty acid by-products. A. P. H. Desborough, J. Reilly, and A. C. Thaysen. April 20, 1918.

128,714. Fermentation products. A. P. H. Desborough, J. Reilly, A. C. Thaysen, and F. R. Henley. June 20, 1918.

128,740. Regenerative oven or furnace. B. W. Brooks. June 28, 1918.

118,605. Aluminous materials, Process of purifying. Norton Co. August 18, 1917.

128,791. Charcoal and gas. Apparatus for the manufacture of. G. Beccari. August 13, 1918.

128,806. Hydrocarbons, Process and apparatus for cracking. A. E. White (from Sinclair Refining Co.). September 12, 1918.

128,815. Fuel, Artificial. D. Evans. November 19, 1918.

128,818. Antimonious oxide, Production of. E. F. Morris. October 8, 1918.

128,823. Regenerative furnaces, Gas-reversing valves for. F. W. Knowles. October 24, 1918.

128,833. Tin from tinned metals, Process for the recovery of. A. W. Gregory. October 10, 1918.

121,124. Carbon matter, Apparatus for completely gasifying combustible. L. Colson. November 26, 1917.

128,874. Crucible furnaces, Rocking. M. Mathy. February 22, 1919.

126,640. Electrolytic gas generators. I. H. Levin. May 22, 1917.

Birmingham Chemists' War Work

The Birmingham Education Committee report that very valuable service was rendered to the Government during the period of the war by the staff of the Technical School, and particularly by the staff of the Chemical Department, headed by Dr. T. S. Price, O.B.E., Lieut.-Commander, R.N.V.R., Mr. S. A. Brazier, Lieut. R.N.V.R., and Mr. A. S. Wood. In the manufacture for the Government of special drugs—diethylamine and acetal—honorary work was done by them under the direction of the Royal Society Committee, and its value had been officially acknowledged. Later Dr. Price and Mr. Brazier took up pioneer work at the Royal Naval Experimental Station, Stratford, which was started by the Government as a result of the German use of poison gas. A large number of Birmingham chemical students joined the Forces, and they were drafted to that station for special chemical work under Dr. Price, who, in April, 1917, was put in charge of all the chemical and technical work undertaken at the experimental station. The work consisted of the manufacture of certain poisonous gases for military use, and of other gases used for smoke screens and smoke boxes used in the Navy. The smoke material thus manufactured was that which was chiefly used in the Zeebrugge and Ostend operations, and many of the volunteers who worked the smoke appliances during the operations were students of the Birmingham University or Technical School. The smoke had also been used in connection with a large number of land tanks, under the superintendence of Sub-Lieut. Howson, a former student at Birmingham. While Dr. Price controlled the work of the Experimental Station, Mr. Brazier was in direct charge of the smoke manufacture. Dr. Price continues to serve as a member of the Chemical Welfare Committee as a representative of the Admiralty.

Hodder & Stoughton have in the press "The New Teaching Series," which claims to be an entirely new departure in textbooks. The volumes already in hand include:—"Chemistry from the Industrial Standpoint," by P. C. L. Thorne, B.A.; and "Chemistry and Bacteriology of Agriculture," by E. J. Holmyard, B.A.

Trade Enquiries

From the Board of Trade Journal of July 24.

Belgium.

CHEMICAL PRODUCTS, INSTRUMENTS, ETC.—A Belgian enquirer desires an agency, in Belgium, for United Kingdom firms dealing in pharmaceutical, veterinary, and industrial chemical products, and optical, photographic, and scientific instruments and material. The applicant has been a dealer in chemical pharmaceutical products, in Brussels, since 1902, and has had good results. Financial standing satisfactory.

INDUSTRIAL CHEMICALS AND PHARMACEUTICAL PRODUCTS.—An agent in Liége desires to secure an agency, with depot, for the sale of industrial chemicals and pharmaceutical products. The enquirer has had ten years' business experience and has specialised in the study and analysis of chemical products. (Reference No. 212.)

PHARMACEUTICAL PRODUCTS AND SPECIALITIES.—An agent in Liége desires to represent United Kingdom exporters of pharmaceutical products and specialities. The enquirer visits regularly the doctors and chemists of the locality. (Reference No. 221.)

CHEMICALS AND KINDRED COMMODITIES.—An agent at Bâle wishes to represent United Kingdom firms dealing in chemicals, drugs, &c. (Reference No. 252.)

CHEMICALS, FABRICS, &c.—A Belgian-born subject, with showroom and store in Brussels and travellers throughout Belgium, North of France and Luxembourg, claiming to have large connections among buyers and manufacturers, with ten years' experience in import and export trade in Belgium, France (and Germany), desires to secure agencies for fine chemicals and drugs, gas mantles, varnishes, chemicals, leather (imitation), cold glues, linoleum, non-ferrous metals in general, &c. Correspondence in English. The applicant is willing to arrange for suitable advertising and circulate samples and price-lists every week, with prices delivered free, in French and Belgian cities, including Customs duties. (Reference No. 231.) Replies should be addressed to the Department of Overseas Trade.

Japan.

TEXTILES, CHEMICALS, DRUGS, MACHINERY, ETC.—A Japanese export house, with offices in London, desires to communicate with suppliers of chemicals, drugs, glue and gelatine, dyes and dyestuffs, paper and pulp, guns and explosives, rubber, asbestos, iron and steel manufactures, tin plates, etc.

Switzerland.

CHEMICALS AND KINDRED COMMODITIES.—An agent at Bâle wishes to represent United Kingdom firms dealing in chemicals, drugs, etc.

Argentina.

The following list of materials required by manufacturers, etc., in Argentina, has been received from the Argentine Legation in London.

Anhydrous ammonia.
Aniline.
Carbide of Calcium.
Caustic Soda for various industries, especially for manufacturing soap, coal tar oil.
Commerical carbolic acid.
Chrystalised chloride of tin.
Ferro-manganese and ferro-silicon for casting steel.
Sulphate of alumina.
Sulphur, in tubes.

New York.

CHEMICALS, DRUGS, DYES, &c. A firm of commission merchants, exporters and importers in New York City desire to become the purchasing or selling agents of a limited number of responsible United Kingdom manufacturers of, or dealers in, chemicals, drugs, and dyes, and allied products. Firms should state the amount of subsidies and commission allowed, if cabling costs are paid by them, and whether they are prepared to make offers of parcels as opportunities arise. (Reference No. 262.) Replies should be addressed to the Department of Overseas Trade.

Chemical Matters in Parliament

Oil Supply.

MR. JESSON asked the President of the Board of Trade whether, having regard to the increasing demand for oil fuel for industrial purposes both in this and other countries, he would, in conjunction with the Governments of our Dominions and Colonies and the Secretary of State for the Colonies, consider the advisability of organising and co-ordinating all the sources of oil supply within the British Empire with a view to preventing such supplies coming under the control of cosmopolitan financiers and others seeking to establish a world monopoly in oil?

Mr. KELLAWAY: I have been asked by the First Lord of the Admiralty, the Minister in charge of petroleum affairs, to state that this matter is receiving consideration and was one of the subjects discussed at the last Imperial Conference.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations July 16	July 23
Alby United Carbide Factories, Lim., Ord.	$\frac{15}{16}$–1 $\frac{1}{16}$	$\frac{15}{16}$–1 $\frac{1}{16}$
Associated Portland Cement Manufrs. (1900.) Lim., Ord.	7 $\frac{13}{16}$–8 $\frac{1}{16}$	7 $\frac{9}{16}$–7 $\frac{13}{16}$
Bell's United Asbestos Co., Lim., Ord.	2–2 $\frac{1}{4}$	1 $\frac{15}{16}$–2 $\frac{1}{16}$
Bleachers' Association, Lim., Ord.	1 $\frac{9}{32}$–1 $\frac{11}{32}$	1 $\frac{5}{16}$–1 $\frac{3}{8}$
Borax Consolidated, Lim., Prefd. Ord.	4 $\frac{1}{4}$–4 $\frac{3}{4}$	4 $\frac{1}{4}$–4 $\frac{3}{4}$
Bradford Dyers' Assoc. Lim., Ord.	2 $\frac{1}{4}$–2 $\frac{1}{2}$	2 $\frac{3}{16}$–2 $\frac{5}{16}$
British Aluminium Co., Lim., Ord.	1 $\frac{11}{16}$–1 $\frac{13}{16}$	1 $\frac{9}{16}$–1 $\frac{11}{16}$
British Oil and Cake Mills, Lim., Ord.	2–2 $\frac{1}{8}$	2 $\frac{7}{32}$–2 $\frac{9}{32}$
British Portland Cement Manufrs., Lim., Ord.	33/0–35/0	31/6–33/6
Brunner, Mond & Co., Lim., Ord.	1 $\frac{7}{8}$–2	2–2 $\frac{1}{16}$
Castner-Kellner Alkali Co., Lim.	2 $\frac{5}{8}$–2 $\frac{7}{8}$	2 $\frac{5}{8}$–2 $\frac{7}{8}$
China Clay Corporation, Lim., Ord.	$\frac{1}{4}$–$\frac{3}{8}$	$\frac{1}{4}$–$\frac{3}{8}$
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.	57–61	57–61
Courtaulds, Lim.	10–10 $\frac{1}{2}$	10–10 $\frac{1}{2}$
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce.	$\frac{7}{8}$–1 $\frac{1}{8}$	$\frac{7}{8}$–1 $\frac{1}{8}$
Curtis's & Harvey, Lim.	2 $\frac{9}{16}$–2 $\frac{13}{16}$	2 $\frac{9}{16}$–2 $\frac{13}{16}$
Explosives Trades, Lim., Ord.	21/6–22/6	20/6–21/6
Field (J. C. & J.), Lim., Ord.	$\frac{7}{16}$–$\frac{9}{16}$	$\frac{7}{16}$–$\frac{9}{16}$
Greenwich Inlaid Linoleum (Fredk Walton's New Patents) Co., Lim., Ord.	$\frac{1}{2}$–$\frac{5}{8}$	$\frac{1}{2}$–$\frac{5}{8}$
Harrison & Crosfield, Lim., 10% Cum. Prefd. Ord.	1 $\frac{11}{32}$–1 $\frac{15}{32}$	1 $\frac{11}{32}$–1 $\frac{15}{32}$
India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.	17 $\frac{1}{4}$–17 $\frac{3}{4}$	17 $\frac{1}{4}$–17 $\frac{3}{4}$
Lawes' Chemical Manure Co., Lim., Ord.	6–6 $\frac{1}{4}$	6–6 $\frac{1}{2}$
Lever Bros., Lim., 6 % Cum. "A" Prefce.	19/1 $\frac{1}{2}$–19/7 $\frac{1}{2}$	19/3–19/9
Do. 6 $\frac{1}{2}$ % Cum. "B" Prefce.	19/10 $\frac{1}{2}$20/4 $\frac{1}{2}$	19/10 $\frac{1}{2}$20/4 $\frac{1}{2}$
Magadi Soda Co., Lim., Ord.	1 $\frac{3}{32}$–1 $\frac{7}{32}$	1 $\frac{1}{16}$–1 $\frac{3}{16}$
Manganese Bronze and Brass Co., Lim., Ord.	$\frac{11}{16}$–$\frac{13}{16}$	$\frac{11}{16}$–$\frac{13}{16}$
Maypole Dairy Co., Lim., Defd. Ord.	1 $\frac{1}{4}$–1 $\frac{3}{16}$	1 $\frac{1}{4}$–1 $\frac{5}{16}$
Mond Nickel Co., Lim., 7% Cum. Pref.	1 $\frac{1}{16}$–1 $\frac{3}{16}$	1 $\frac{1}{16}$–1 $\frac{3}{16}$
Do. 7% Non. Cum. Pref.	$\frac{15}{16}$–1 $\frac{1}{16}$	$\frac{15}{16}$–1 $\frac{1}{16}$
Pacific Phosphate Co., Lim., Ord.	5 $\frac{7}{16}$–5 $\frac{11}{16}$	5 $\frac{1}{4}$–5 $\frac{1}{2}$
Power-Gas Corporation, Lim., Ord.	$\frac{3}{4}$–$\frac{7}{8}$	$\frac{3}{4}$–$\frac{7}{8}$
Price's Patent Candle Co., Lim.	38–40	38–40
Salt Union, Lim., Ord.	1 $\frac{1}{4}$–1 $\frac{3}{8}$	1 $\frac{1}{4}$–1 $\frac{3}{8}$
United Alkali Co., Lim., Ord.	1 $\frac{1}{4}$–1 $\frac{3}{8}$	1 $\frac{1}{4}$–1 $\frac{3}{8}$
Val de Travers Asphalte Paving Co., Lim.	$\frac{15}{16}$–1 $\frac{1}{16}$	$\frac{15}{16}$–1 $\frac{1}{16}$
Van den Berghs, Lim., Ord.	3 $\frac{1}{4}$–3 $\frac{1}{2}$	3 $\frac{5}{16}$–3 $\frac{9}{16}$
Walkers, Parker & Co., Lim.	1 $\frac{1}{16}$–1 $\frac{3}{16}$	1 $\frac{5}{32}$–1 $\frac{5}{32}$
Welsbach Light Co., Lim.	2 $\frac{1}{2}$–2 $\frac{3}{4}$	2–2 $\frac{1}{4}$

Gas, Iron, Coal and Steel

Gas Light and Coke Co., Ordinary Stock (4% Stand.)	55–57	54–56
South Metropolitan Gas Co., Ordinary (4% Stand.)	55–57	53–56
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.	1 $\frac{3}{8}$–1 $\frac{7}{16}$	1 $\frac{1}{4}$–1 $\frac{5}{16}$
Hadfield's, Limited, Ordinary	1 $\frac{3}{4}$–1 $\frac{15}{16}$	1 $\frac{27}{32}$–1 $\frac{29}{32}$
Staveley Coal & Iron Co., Lim., Ord.	1 $\frac{11}{16}$–1 $\frac{13}{16}$	1 $\frac{11}{16}$–1 $\frac{13}{16}$
Vickers, Limited, Ordinary	35/0–36/0	34/0–35/0
Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	34/6–35/6	34/0–35/0

Mines, Nitrate, &c.

Rio Tinto Co., Lim., Ord. (Bearer)	61–62	61–62
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5 $\frac{1}{2}$% 1st. Mt. Debs. Red.	88–93	88–93
Lagunas Nitrate Co., Lim.	1 $\frac{1}{4}$–1 $\frac{3}{8}$	1 $\frac{1}{4}$–1 $\frac{3}{8}$
Tarapacá and Tocopilla Nitrate Co., Lim.	14/0–16/0	14/6–15/6
Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	14–15	13 $\frac{1}{2}$–14 $\frac{1}{2}$

Oil and Rubber

Anglo-Persian Oil Co., Lim., Cum. 6 % Part.	1 $\frac{5}{16}$–1 $\frac{3}{8}$	1 $\frac{5}{16}$–1 $\frac{3}{8}$
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	8 $\frac{31}{32}$–$\frac{33}{32}$	8 $\frac{7}{16}$–8 $\frac{13}{32}$
"Shell" Transport and Trading Co., Lim., Ord.	8–8 $\frac{1}{4}$xd	7 $\frac{7}{8}$–8xd
Do. 5% Cum. Pref.	9 $\frac{1}{16}$–9 $\frac{5}{16}$	9 $\frac{1}{8}$–9 $\frac{3}{8}$
Anglo-Java Rubber & Produce Co., Lim.	5/10 $\frac{1}{2}$–6/4 $\frac{1}{2}$	5/10 $\frac{1}{2}$–6/4 $\frac{1}{2}$
Anglo-Malay Rubber Co., Lim.	13/0–13/6	12/7 $\frac{1}{2}$–13/1 $\frac{1}{2}$
Chersonese (F.M.S.) Estates, Lim.	3/9–4/0	3/7 $\frac{1}{2}$–3/10 $\frac{1}{2}$
Linggi Plantations, Lim., Ord.	.. ..	.. ..
Anglo-Maikop Corporation, Ltd., Ord.	6/9–7/9	6/9–7/9
Burmah Oil Co., Ltd., Ord.	11 $\frac{1}{2}$–11 $\frac{3}{4}$	11–11 $\frac{1}{4}$

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. Only commodities whose values are at the time of particular interest or of a fluctuating nature are included in our weekly report. A more complete list and report, including a Continental and American report, appears in the first issue of each month, and will include prices of plant supplies, building materials, structural steel, fuels, glues, ores, refractories, metals, minerals, and miscellaneous materials, as soon as the necessary arrangements are completed. Our issue of July 5 contained some of these items. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report. Suggestions and criticisms in regard to these pages will be welcomed.*

Market Report

THURSDAY, July 24, 1919.

Business this week has been decidedly more active despite the coal trouble in Yorkshire, although obviously if this continues many days it must have a disastrous effect on the productive industries of this country.

Values generally are maintained, and in one or two cases there are increases to be noted.

Export business is still extremely active, and foreign buyers are now more ready to operate.

The Exchange question, however, still presents difficulties, and it is not easy to see how these can be overcome.

The position of import of chemicals into this country still remains rather obscure.

General Chemicals

ACID ACETIC.—The price of Glacial has been raised by the American makers, and dearer freights have compelled merchants to refuse orders for 80 per cent. based upon last week's quotations. The market is decidedly firmer.

ACID CARBOLIC.—Several important orders have been received from abroad—notably Japan—which accounts for the sharp advance of 1d.—1½d. per lb. Manufacturers expect to realise better prices for the remainder of their 1919 output.

ACID CITRIC.—The raw material continues to become dearer owing to the falling Italian exchange. There is likely to be considerable demand from the Central Empires presently, which would immediately cause an advance in the price of the acid.

ACID LACTIC.—A very steady business is being done for this acid.

ACID OXALIC.—Buyers are inclined to operate cautiously in view of the lower prices which are being reported from neutral countries.

AMMONIA PHOSPHATE.—There is a keen demand for near delivery, but producers are practically now fully sold until September.

BARIUM SALTS.—As these products do not appear in the list of prohibited imports, we shall probably hear of keen competition from the Continent before long. Cheaper supplies of Sulphate would be welcomed.

BORAX.—There is no change in the position in this article, which is exceedingly scarce for near delivery.

COPPER SULPHATE.—Trade is still stagnant. The controlled price remains the same, but parcels can be readily purchased at under this figure.

LEAD ACETATE.—A very active business has been done for the English product, and there is no reason that imports should be necessary, and English manufacture can in all respects compare with the finest pre-war make.

LEAD CARBONATE.—The demand is out-distancing the supply available for home and export trades to such an extent that manufacturers may have to notify a further advance in price very shortly.

LITHOPHONE.—This material is now in very short supply. The market is firmer, and producers are very fully sold for the next two or three months.

POTASH BICHROMATE.—Important business is passing for export, many markets being bare of stock.

POTASH CARBONATE.—Apparently nothing definite is yet known as to whether importations will be permitted from Germany and Austria. Meanwhile purchasing is entirely restricted to spot parcels, for which good prices are still being paid.

POTASH PERMANGANATE.—We would not be surprised to see an important change in the position of this article in the near future. In our opinion there can be no justification why the present high prices should remain any longer in force.

POTASH PRUSSIATE.—We understand that import permits are being sparingly granted. Business has been livelier, and prices are tending upwards.

SODA CAUSTIC.—There has been more demand from abroad, and some important export business has been transacted at makers' prices. Secondhand lots are freely offered for home trade without finding buyers.

SODA HYPOSULPHITE.—With improving prospects in the leather industry, manufacturers should have no difficulty in disposing of their productions.

SODIUM NITRATE.—There is an increased demand for this material, but there are fair stocks available at current figures.

SODIUM SULPHIDE.—There is no change in the position of this article, although if the coal strike continues a scarcity will be very soon apparent.

ZINC SALTS.—A welcome improvement in the volume of business passing is noticed, in particular the increase in the demand for Chloride.

Heavy Coal Tar Products

The uncertainty with regard to supplies of coal is having a very disturbing effect upon the market. Manufacturers are unwilling to enter into contracts for future deliveries owing to the doubt of supplies from the collieries both as regards coke ovens and gas works.

On the other hand, the disturbance of the railway traffic in the north is preventing deliveries of prompt parcels, and in many cases the material required by consumers in this country is held up for want of transport.

BENZOL.—A small amount of business is still being done for export at 1s. 0d. per gallon, and the home trade is steady at 2s. to 2s. 3d. per gallon.

CREOSOTE.—The advance in the price of coal has called attention to all kinds of fuel oils, and the tendency to lower prices which was noticeable a little while ago has been arrested. To-day's quotations for ordinary Creosote are 5½d. to 5¾d. per gallon, and for special qualities 6d. to 6½d. per gallon, according to place of delivery.

CRESYLIC ACID.—This is still quiet, with sellers at 2s. to 2s. 3d. per gallon.

NAPHTHALENE is rather firmer, and refined may be quoted at from £17 to £18, while crude is in fair demand at late prices.

SOLVENT NAPHTHA.—There is some small improvement in the demand for export, and further business has been done for the home trade, but without showing any improvement in prices. Quotations remain at 1s. 9d. to 2s. in the North and 2s. 1d. to 2s. 3d. in the London district.

PITCH.—The market has been more active, and higher prices are asked in several quarters.

Sulphate of Ammonia

Owing to the uncertainty of supplies, through the lack of coal, the market is disturbed, and licences for export are more difficult to obtain.

Prices, however, are unchanged.

Coal Tar Intermediates

With the exception of a few material reductions in certain Intermediates the market generally remains steady.

ANTHRACENE.—Is now obtainable in the higher strength of 80/85 per cent. The 90/95 per cent. quality is expected to be ready shortly.

ANTHRAQUINONE.—The output is increasing, and makers are now prepared to consider serious business.

BENZALDEHYDE.—A marked drop in price is indicated in our column. Consumers appear to be no longer dependent on imported supplies, owing to the increased production in this country of the technical quality, practically free from chlorine.

BENZYL CHLORIDE.—The price is slightly easier, with more business passing.

BETANAPHTHOL.—A strong demand continues, and manufacturers have some difficulty in keeping pace with orders.

RESORCIN TECHNICAL.—An active demand continues for the imported product, and several important orders have been taken.

Current Prices

Chemicals

July 24, 1919.

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	3	0	to	0	3	3
Acetone, pure	ton	95	0	0	to	97	0	0
Acid, Acetic, glacial, 99-100%	ton	79	10	0	to	81	0	0
Acetic, 80% pure	ton	62	10	0	to	65	0	0
Carbolic, crystal, 39-40°	lb.	0	0	7	to	0	0	7½
Citric	lb.	0	4	4	to	0	4	5
Lactic, 50% vol.	ton	66	0	0	to	68	0	0
Lactic, 60% vol.	ton	83	0	0	to	85	0	0
Oxalic	lb.	0	1	2½	to	0	1	3
Pyrogallic cryst.	lb.	0	11	3	to	0	11	6
Tannic, coml.	lb.	0	2	9	to	0	3	0
Tartaric	lb.	0	3	3	to	0	3	4
Alum, lump	ton	17	10	0	to	17	15	0
Aluminium sulphate, 14-15%	ton	13	10	0	to	14	0	0
Aluminium sulphate, 17-18%	ton	17	0	0	to	17	10	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
.880	ton	32	10	0	to	37	10	0
Carbonate	lb.	0	0	6½				
Muriate	ton	46	0	0	to	48	0	0
Nitrate	ton	55	0	0	to	57	10	0
Phosphate	ton	112	0	0	to	115	0	0
Arsenic, white 99-100%	ton	40	0	0	to	42	0	0
Barium, Carbonate, 92-94%	ton	11	0	0	to	12	0	0
Chloride	ton	26	10	0	to	27	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate (blanc fixe), dry	ton	25	10	0	to	26	0	0
Sulphate (blanc fixe), pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	13	0	0	to	13	10	0
Borax crystals	ton	44	0	0	to	45	0	0
Calcium acetate, grey	ton	19	0	0	to	19	10	0
Calcium chloride	ton	9	0	0	to	9	10	0
Casein, technical	ton	80	0	0	to	82	0	0
Cobalt oxide, black	lb.	0	7	9	to	0	8	0
Copper sulphate	ton	45	0	0	to	47	0	0
Cream Tartar, 98-100%	ton	235	0	0	to	240	0	0
Epsom Salts (see Magnesium Sulphate).								
Iron, perchloride	ton	32	0	0	to	34	0	0
Sulphate (copperas)	ton	4	15	0	to	4	17	6
Lead, Acetate, white	ton	82	10	0	to	85	0	0
Carbonate (White Lead)	ton	51	0	0	to	55	0	0
Nitrate	ton	58	0	0	to	59	0	0
Lithopone, 30%	ton	42	0	0	to	43	0	0
Magnesium, Chloride	ton	15	0	0	to	16	0	0
Carbonate, light	cwt.	3	0	0	to	3	5	0
Sulphate (Epsom salts, coml.)	ton	11	10	0	to	12	10	0
Magnesium Sulphate (druggist's)	ton	17	0	0	to	18	0	0
Methyl Acetone	ton	89	0	0	to	90	0	0
Methyl Alcohol, 1% Acetone	gall.	0	9	0	to	0	9	6
Potassium, Bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	90	0	0	to	92	0	0
Chlorate	lb.	0	1	2	to	0	1	3
Metabisulphite, 50-52%	ton	210	0	0	to	220	0	0
Nitrate refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	3	0	to	0	3	3
Prussiate, yellow	lb.	0	1	10	to	0	1	11
Prussiate, red	lb.	0	6	0	to	0	6	3
Sulphate	ton	37	10	0	to	40	0	0
Sal. Ammoniac, firsts	cwt.	4	0	0				
Sal. Ammoniac, seconds	cwt.	3	15	0				
Sodium, Acetate	ton	52	0	0	to	55	10	0
Arseniate, 45%	ton	47	10	0	to	48	10	0
Bicarbonate	ton	9	0	0	to	9	10	0
Bisulphite, 60-62%	ton	29	0	0	to	30	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Caustic, 70%	ton	20	0	0	to	20	10	0
Caustic, 76%	ton	23	10	0	to	24	0	0
Hyposulphite, coml.	ton	18	0	0	to	19	10	0
Nitrite, 96-98%	ton	58	10	0	to	60	0	0
Phosphate cryst.	ton	25	0	0	to	25	10	0
Prussiate	lb.	0	0	7½	to	0	0	8
Sulphide, cryst.	ton	15	10	0	to	16	0	0
Sulphide, solid, 60-62%	ton	22	0	0	to	23	10	0
Sulphite, cryst.	ton	11	0	0	to	11	10	0
Strontium, Carbonate	ton	85	0	0	to	90	0	0
,, Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur, chloride	ton	38	0	0	to	40	0	0
Tetrachlorethane (Westron)	ton	60	0	0	to	65	0	0
Tin perchloride, 33%	lb.	0	2	4	to	0	2	5
,, Protochloride (tin crystals)	lb.	0	1	8	to	0	1	9
Trichlorethylene (Westrosol)	ton	75	0	0	to	80	0	0
Zinc, chloride, 102 Tw.	ton	22	0	0	to	23	0	0
Chloride, solid, 96-98%	ton	60	0	0	to	62	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	80	0	0	to	85	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	6	to	0	2	9
Aniline oil, drums free	lb.	0	1	2	to	0	1	3
Aniline salts	lb.	0	1	3½	to	0	1	4
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	3	9
Benzidine, base	lb.	0	5	6	to	0	6	0
Benzidine, sulphate	lb.	0	4	9	to	0	5	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	1	9	to	0	2	0
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	8	0
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	2	0	to	0	2	3
Dinitrotoluol	lb.	0	1	10	to	0	2	0
Dinitrophenol	lb.	0	1	10	to	0	2	0
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	0	to	0	3	3
H-Acid	lb.	0	7	6	to	0	8	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Naphthionic acid, crude	lb.	0	3	6	to	0	3	9
Naphthylamin-di-sulphonic acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	6
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	0	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	4	0	to	0	4	6
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic, anhydride	lb.	0	14	0	to	0	15	0
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	0	to	0	2	2
Salol	lb.	0	4	6	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	2	to	0	1	3
Toluidine, base	lb.	0	9	0	to	0	10	0
Toluidine, mixture	lb.	0	2	9	to	0	3	0

Company News

ALLEN EVERITT & SONS.—At the ordinary general meeting of the shareholders of Allen Everitt & Sons, Kingston Metal Works, Smethwick, Sir George Bean, who presided, said that as there were certain matters outstanding in connection with excess profits duty, the usual accounts would not be presented.

AMALGAMATION OF RUSSIAN OIL COMPANIES.—Arrangements have been made for the combination of the Baku Russian Petroleum, the Bibi Eibat, the European Oilfields, and the Russian Petroleum Companies under the title of the Baku Consolidated Oilfields, Ltd. It is proposed to eliminate all debentures, which entail a charge of over £70,000 per annum, to discharge all debts and obligations, including arrears of debenture interest, and to provide new working capital. The new company will have an authorised capital of £2,500,000, divided into 1,250,000 "A" shares of £1 each (Preferred Ordinary) and 1,250,000 "B" shares of £1 each (Ordinary). The "A" shares will be entitled to a non-cumulative preferential dividend of 8 per cent. per annum, and to participate equally in any profits beyond 8 per cent. per annum on the "B" shares.

SUGAR AND MALT PRODUCTS AMALGAMATION.—It is reported that Sugar and Malt Products, Ltd., is amalgamating with the Manbré Saccharine Co., of Hammersmith, and extraordinary general meetings are being held during the next few weeks to confirm the agreements that have been signed between the respective boards. The average dividends paid by the Sugar and Malt Products for the last five years have exceeded 12½ per cent., and it has been arranged that the management of the united company shall be in the hands of the Sugar and Malt Products people, as their business has shown such steady development. There is no free market in Sugar and Malt Products shares, but Manbré Saccharine stands at about 2⅜ for the ordinary and ⅞ for the preference

WELSBACH LIGHT.—The net profit of the Welsbach Light Company for the year ended March 31st (subject to excess profits duty) was £57,130; brought forward, £46,884; dividend of 10 per cent. per annum (less tax), the same plus a bonus of 5 per cent. (less tax) against nil; to reserve for income-tax and excess profits duty, £25,000; general reserve, £35,000; forward, £17,764.

BIBI EIBAT OIL CO.—A meeting of debenture-holders has been called for noon on August 27th, at 48, Cannon Street, E.C., to consider resolutions for accepting in discharge of the debentures fully-paid shares of the new company, entitled Baku Consolidated Oilfields, Ltd., at the rate of 25 fully-paid "A" shares of £1 each and 75 fully-paid "B" shares of £1 each for every £100 debenture, and so in proportion for a smaller amount of debentures held.

BORAX CAPITAL INCREASED.—At an extraordinary general meeting of Borax Consolidated, Ltd., on Wednesday, it was resolved that the capital of the company be increased from £2,300,000 to £2,900,000 by the creation of 600,000 new deferred ordinary shares of £1 each, to rank equally with the original deferred ordinary shares of the company. The chairman (the Earl of Chichester) referred to contemplated development of business in new products and to the building of additional works. We are, he said, at the present time inundated with orders and inquiries for our goods, largely for export. It is evident that, owing to the exhaustion of stocks in many countries, owing to war conditions, there must be a large demand upon us to replenish these, and we anticipate that our mines and refineries will be occupied to their fullest capacity in meeting these demands. I hope that this condition will last, and that the various countries will now settle down to production, and in that case we must, owing to the many and large industrial uses for our products, be kept busy for a long time to come.

BRITISH MEXICAN PETROLEUM CO.—The British Mexican Petroleum Co., Ltd., has been registered as a private company, with a nominal capital of £2,000,000 in 1,000,000 ordinary series "A" and 1,000,000 ordinary series "B" shares of £1 each. The objects are: To enter into an agreement with the Huasteca Petroleum Co.; to buy, sell, refine, transport, and deal in oils, petroleum, gas, and minerals and their products, by-products, and ingredients, constructors of pipe lines, prospectors, shipowners, miners, &c. The subscribers of the memorandum of association (each signing for one share) are: J. F. Cooke, Melrose, Whitworth Road, S. Norwood, secretary to public company, and H. H. Anstwick, Ganton, Sidcup, Kent, solicitor. The first directors are: Lord Pirrie, Mr. William Weir, Sir Thomas Royden, Sir Peter McClellan, Mr. James B. R. Morton, Sir James T. Currie, Mr. E. L. Doheny, Mr. Herbert S. Wylie, Mr. E. L. Doheny, jun., Mr. Elisha Walker, Mr. J. M. Danziger, Mr. L. P. Sheldon. Qualification, £100. Remuneration, £500 each per annum (chairman £1,000). Solicitors, Norton, Rose & Co., 57½, Old Broad Street, E.C. File number, 157,038.

CAPE ASBESTOS.—The accounts of the Cape Asbestos Company for 1918 show a profit, after making estimated provision for excess profits duty, income-tax, &c., and including income from associated companies and profit of sale of investments, of £39,290; net profit, £13,417 against £13,571. To reserve fund, £5,000; dividend of 6 per cent. per annum on the Ordinary shares, less tax, against 5 per cent.; to Preference shareholders an amount equivalent to the dividend on the Ordinary shares, less tax; £6,074 forward, against £5,907.

COALITE AMALGAMATION.—At meetings this week of British Coalite Co., Ltd., and Coalite Ltd., resolutions were passed for the amalgamation of both companies with Low Temperature Carbonization, Ltd., Under the scheme the British Coalite ordinary shareholders get eleven participating preference shares in the new concern for every ten ordinary shares, and deferred shareholders 17 participating preference shares for every 20 deferred shares. Holders of ordinary and deferred shares in Coalite get one participating preference share of £1 for each ordinary Coalite share, and 16 participating preference shares for every 20 deferred shares.

COURTAULDS.—Interim dividend of 4s. per share (20 per cent.), free of tax.

GAS LGHT AND COKE COMPANY.—Dividend for the half-year ended June 30th at the rate of £2 13s. 4d. per cent. per annum on the Three-and-a-Half per Cent. Maximum stock, and, subject to the approval of the Board of Trade, a dividend at the rate of £3 per cent. per annum on the Ordinary stock, against £2 18s. 8d. per cent. for corresponding period last year.

JOINT MANAGEMENT OF PORTLAND CEMENT COMPANIES.—The question of the closer union of the Associated Portland Cement manufacturers (1900) and the British Portland Cement Manufacturers have been receiving the attention of the boards of both companies. It is felt that this can best be effected by a scheme of joint management, which will enable substantial reductions to be made in the number of directors and managing directors. The following will be managing directors of both companies under the chairmanship of Brigadier-General the Hon. Ferdinand C. Stanley, C.M.G., D.S.O.—viz., Messrs. H. H. D. Anderson, H. K. G. Bamber, Alfred Brooks, A. C. Davis, Alfred Stevens, P. M. Stewart, and Anthony White. Mr. H. E. Brooks, who for so many years has been devoting himself largely to the companies' interests abroad, will have special duties principally in this connection. Sir Guy Granet has consented to join the boards of the two companies. The issued capital of the two companies is:—Associated Company, £4,207,040; British Company, £2,552,622.

KYNOCH, LTD.—At the annual meeting of the shareholders of Kynoch, Ltd., on Wednesday, Mr. Arthur Chamberlain, the chairman, in moving the adoption of the report, remarked that there were only 21 shareholders, representing about 2,000 shares, who had not consented to the exchange of shares for those of the Explosives Trades Ltd., and he thought that was more likely due to the fact that they had mislaid the papers than that they were not willing to make the exchange. It was obviously to their advantage to make the exchange. Mr. H. Donald Hope seconded, and the report was adopted. Mr. Hope was re-elected a director.

MAYPOLE DAIRY. The directors recommend that £370,000 of the reserve fund be capitalised, and that two new Deferred Ordinary shares be allotted for every three such shares now held.

RHODESIA COPPER AND GENERAL EXPLORATION AND FINANCE.—The accounts for the year ended March 31st show an available sum of £25,303, out of which the directors recommend a dividend of 10 per cent., less tax, absorbing £17,601.

"SHELL" TRANSPORT.—Messrs. Kuhn, Loeb & Co., New York, have completed negotiations for the acquisition of 750,000 shares of the common stock of the Shell Transport and Trading Co. A syndicate is to be formed to introduce the shares in the United States.

SCOTTISH OIL COMBINE.—The terms under which the Anglo-Persian Oil Company are prepared to purchase the whole of the issued ordinary shares of the Scottish oil companies are as follows:—Pumpherston Co.—285,500 ordinary shares of £1, fully paid, at £5 per share. Oakbank Co.—200,000 ordinary shares of £1 each, 17s. paid, at 37s. 6d. per share. Broxburn Co.—235,000 ordinary shares of £1 each, fully paid, at £2 per share. Young's Paraffin Light and Mineral Oil Co.—113,202 ordinary shares of £4 each, fully paid, at 63s. per share. James Ross & Co., Philpstoun Oil Works.—135,000 ordinary shares of £1 each, fully paid, at 25s. per share. The capital of the new Scottish company to be formed will be £4,000,000, and will consist of 3,000,000 7 per cent. non-cumulative participating preference shares of £1 each, £3,000,000; and 1,000,000 ordinary shares of £1 each, £1,000,000. The new company will also acquire the properties and goodwill in Scotland of the British Petroleum Company and the Homelight Oil Company, for the sum of £150,000, payable in cash. The ordinary shares will be subscribed for by the Anglo-Persian Company. Participating preference shares of £1 each fully paid, and ranking for dividend as from May 1st, 1919, will be issued to the shareholders of the various companies.

SHELTON IRON, STEEL AND COAL.—Interim dividend of 6d. per share.

SPIES PETROLEUM CO.—A letter dated June 20th, has been received from the London manager in Grozny, in which he confirms the statement that the company's property is practically intact. He reports that contracts have been concluded for the sale of 4,600,000 poods of oil, for delivery up to December 31st, 1919, at an average of Rs.4.07 per pood, and will realise a total of Rs.18,750,000. The production which at present averages about 8,500 poods per day, can, in the opinion of the company's oil manager, be considerably increased in a short time.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE

Partnership Dissolved

BOWLEY, Joseph John, and BOWLEY, Joseph Plunkett, oil importers and refiners, Wellington Works, Wellington Road, Battersea Bridge, London, under the style of S. Bowley & Son, as from August 21, 1918.

Liquidators' Notices

SIPUTEH TIN MINES, LTD.—A meeting of creditors will be held at 65, London Wall, London, E.C., on Thursday, July 31, at 12.30 p.m. H. Percy Hood, liquidator.

PUSING LAMA TIN MINES, LTD.—A meeting of creditors will be held at 65, London Wall, E.C., on Thursday, July 31, at 12 noon. H. Percy Hood, liquidator.

PUSING BHARU TIN MINES, LTD.—A meeting of creditors will be held at 65, London Wall, E.C., on Thursday, July 31, at 12.15 p.m. H. Percy Hoad, liquidator.

Companies Winding Up Voluntarily

THE NEW CHESHIRE SALT CO., LTD.—Mr. Edward Andrews, 13, Eastgate Row North, Chester, Incorporated Accountant, appointed liquidator. Meeting of creditors at 13, Eastgate Row North, Chester, on July 31, at 3 p.m.

BOUNDARY CHEMICAL CO., LTD.—Mr. Harold Sadler (Finney, Son & Sadler), appointed liquidator.

Notice of Intended Dividend

CLARKE, Sidney, 2, Northampton Gardens, Saint Helen's Road, trading at 28, Waterloo Street, Swansea, oil, colour and glass merchant, &c. August 2. Trustee, Henry Rees, Official Receiver, Government Buildings, St. Mary's Street, Swansea.

Joint Stock Companies.

At the expiration of three months from July 22, the names of the undermentioned companies will, unless cause is shown to the contrary, be struck off the Register, and the companies will be dissolved :—

Chemical Conversion Co., Ltd.

Efficiency Oil Corporation of London, Ltd.

Gravesend Portland Cement Co., Ltd.

Nitrogen Recovery Co., Ltd.

Pharmacy & Drug Store Supply Association (Lancashire), Ltd.

Rupert Film Co., Ltd.

Standard Dye Manufacturing Co., Ltd.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. :—

J. SYDNEY SMITH, LTD., Commercial Buildings, Park Row, Leeds. Curriers, leather merchants, leather dressers, tanners, &c. Nominal capital £10,000 in 10,000 shares of £1 each. Directors: J. S. Smith, Commercial Buildings, Park Row, Leeds; C. Gregg, 4, Hill Rise Avenue, Broad Lane, Bramley, Leeds. Qualification of Directors, £5. Remuneration of Directors: to be voted by company in general meeting.

FORSTER'S GLASS CO., LTD., Atlas Glass Works, St. Helens, Lancs. Glass manufacturers. Nominal capital £350,000 in 175,000 7½ per cent. cumulative participating preference shares of £1 each, and 175,000 ordinary shares of £1 each. Directors: J. Forster, Cowley Hill, St. Helens; W. Forster, The Scholes, St. Helens; W. A. Forster, Abbotsgate, Hayton, Liverpool; Sir S. H. H. Henn, Ixworth Court, Bedford. Qualification of Directors, £250. Remuneration of Directors, £250.

F. J. SUTTON, LTD., dealers in chemicals, &c. Nominal capital £3,000 in 3,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, 10 shares. Remuneration of Directors to be voted by company in general meeting. Subscribers: T. J. Sutton, 697, Coventry Road, Birmingham; Emily L. Nicklin, 34, Chapman Road, Small Heath, Birmingham.

CAMSTAN LEATHER SYNDICATE, LTD., manufacturers of vulcanisable compositions of leather and other materials. Nominal capital £25,000 in 18,000 "A" ordinary shares and 6,000 "B" ordinary shares of £1 each, and 20,000 deferred shares of 1s. each. Directors: S. E. T. Steane, 2, Old Swan Lane, Upper Thames Street, E.C.; J. S. Campbell; F. C. Goodman, Broad Street House, E.C. Qualification of Directors, £100. Remuneration of Directors to be voted by company in general meeting.

BLACKBURN ASPHALTING CO., LTD., Pleasington Street, Witton, Blackburn. Nominal capital, £2,000 in £1 shares. Directors: J. Higleton, J. Marsden, A. Tyldsby, and W. Dewhurst. Qualification of Directors, 1 share. Remuneration of Directors to be voted by company in general meeting.

A. E. HOBBS, LTD., chemists, druggists, opticians, &c. Nominal capital £6,000 in 600 £10 shares. Directors: A. E. Hobbs, 20, St. John's Road, Tunbridge Wells; Mary O. Hobbs, 20, St. John's Road, Tunbridge Wells. Qualification of Directors, £1,000. Remuneration of Directors to be voted by company in general meeting.

"MORESBY SYNDICATE," LTD. To crush, win, get, quarry, smelt calcine manufacturers and to dress and prepare for market, ore, metal and mineral substances of all kinds. Nominal capital £10,000 in 10,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, £50. Remuneration of Directors to be voted by company in general meeting. Subscribers, T. Robson 6, Lloyd's Avenue, E. 6; C. Rose, 6, Lloyd's Avenue, E. 6.

PERCY E. FISHER, LTD., Leather Works, Kingsclere Road, Basingstoke, Hampshire, leather dressers and tanners in all its branches. Nominal capital £200,000 in 100,000 8 per cent. cumulative part. preference shares of £1, and 100,000 £1 ordinary shares. Directors: J. J. Jarvis, The Uplands, Enfield, Middlesex; G. Clare, Meadowside, East Twickenham; E. R. Straker, "Chevington," Clarence Road, St. Albans, and two others. Qualification of Directors, £100. Remuneration of Directors, £250.

CREPIN & DOUMIN, LTD., 15, Coopers Row, E.C., manufacturers of essences, perfumes, oils, and light fluids. Nominal capital £5,000 in 5,000 shares of £1 each. Directors: T. W. Crepin, 113, Bethume Road, Stoke Newington; R. Doumin, 35a, Penywern Road, Earl's Avenue, S.W. Qualification of Directors, £100.

JOHNSTON OPTICAL CO., LTD., 9, Friars Avenue, Carlisle, opticians, glass manufactures, etc. Nominal capital £2,000 in 2,000 ordinary shares of £1 each. Directors: W. A. Whitehead, H. V. Johnston, J. A. Johnston, Annie Johnston. Qualification of Directors, 1 share. Remuneration of Directors, £10.

SOUTH PHŒNIX TIN MINES, LTD, 27, Old Jewry, E.C. To prepare for market, and deal in ore, metal, and mineral substances, &c. Nominal capital £20,000 in 40,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, 1 share. Remuneration of Directors, £100. Chairman, £150.

GROVE METAL REFINING WORKS, LTD., 5, Fen Court, E.C., dealers and refiners of metals and metallic residues. Nominal capital £2,000 in 2,000 shares of £1 each. Directors: A. G. Edwards, 4, Norfolk Road, Seven Kings, Essex; W. J. Stanfield, 28, Danet Road, Wandsworth, S.W.; T. M. Garnham, "Oakdene," Reigate Road, Reigate, Surrey. Qualification of Directors, £200. Remuneration of Directors to be voted by company in general meeting.

Stafford Coal and Iron Company.

The Stafford Coal and Iron Company, Ltd., of Stoke-on-Trent, petitioned in the Chancery Division on Tuesday, before Mr. Justice P. O. Lawrence, for the confirmation of the Court to alterations in the objects of the company.

Mr. C. E. E. Jenkins, K.C., said the petition was brought under Section 9 of the Companies Act. The petitioners were a colliery company incorporated in 1873, which had been very successful, and they now sought power to enable themselves to deal in their own by-products, so as to manufacture chemicals and manures, gas, tar, &c. There was no opposition.

His Lordship made the order.

Dudley Stuart & Co.

The debtor, Lloyd Dudley Stuart, Merchant, 14, America Square Minories, E., described in the receiving order and trading under the style of Dudley Stuart & Co., Merchants, carried on business as a soap manufacturer, and attended at the London Bankruptcy Court on Tuesday week for public examination before Mr. Registrar Mellor, upon a statement of affairs in which he had returned his liabilities at £9,443 19s. 5d., of which £6,162. 10s. 3d. was expected to rank, and his assets at £404 3s. 10d. Examined by the Official Receiver, the debtor said it was in or about 1902 that he began to give attention to the manufacture of soap. He was not a practical chemist and from that point of view he knew nothing about the manufacture of soap. He set up a small factory at Tidal Basin, Canning Town, but afterwards closed it down and then had nothing to do with the manufacture of soap until 1916, then he began to finance two Italians of the name of Wilberforce Borg and Wigram Borg, soap manufacturers, Hoxton, under the style of the Vebo Soap Co. On March 17, 1917, he entered into an agreement with them by virtue of which he was *inter alia* to receive 10 per cent. of the net profits of their business. He advanced them £50, and the business was transferred to Bowes Park. Subsequently he assumed sole financial responsibility and entered into partnership with them, although no formal deed was prepared. On Nov. 23, following the business name was changed to the British Soap Co. In April, 1918, the firm got into trouble for infringing a bye-law of the Wood Green Urban District Council. They had omitted to ask their permission to

manufacture soap and were fined. They then applied for permission to complete certain contracts, but leave was refused. They continued to manufacture for some little time, with the result that they were summoned a second time, and on this occasion undertook to close down the business. Debtor afterwards had nothing to do with the Borgs. Asked with reference to the books of account which had been kept at Bowes Park, the debtor replied that he understood that they had been burnt. The business had been a failure owing to their inability to produce the quantity of soap which they thought they could manufacture. The debtor also contended that in consequence of Government control the firm had been compelled to use fatty acids from which all the glycerine had been extracted and this made the manufacture of soaps far more difficult and more expensive. His present deficiency amounted to £5,758 of which £4,310 related either directly or indirectly to the business at Bowes Park. There was a very considerable liability (£2,984) due to Mr. Peereboom in respect of damages due to him for uncompleted contracts for the supply of soap. Another large creditor was Bourgeois, whose claim was for £1,044 for oils supplied in connection with the Bowes Park business, and who obtained judgment against him last year. In September, 1918, he took a lease of the premises in Kintore Street, and began to manufacture soap under the style of Dudley Stuart & Co. He had made a profit, although no accounts were prepared, and he continued the business hoping for improvement until Bourgeois presented the petition in bankruptcy. Since starting that business he had contracted liabilities amounting to £4,216, of which £2,975 were, in his view, nearly fully secured. This was the first occasion on which he had failed and he had never made any arrangement with his creditors.

The examination was concluded.

For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

PETROLOGICAL MICROSCOPES and other Microscopes bought, sold or exchanged. John Browning, (Dept. 24), 146, Strand, W.C.2.

CANVAS BAGS, in excellent condition, size 16 by 22 inches, 6,000 to 8,000 for sale, £19 per thousand, f. o. r.—Sheffield Flatware Co., Ltd., 43, Solly Street, Sheffield.

THREE TAR STILLS FOR SALE, each of 10 and 12 tons capacity, complete with fittings, perfect condition.—Apply Box No. 11, CHEMICAL AGE Offices, 8, Bouverie Street, E.C.4.

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(Twenty-seven words, 2s.; every additional nine words, 6d.)

METALLURGIST and TECHNICAL CHEMIST Assoc. Inst. M. M., M. Soc. Chem. Ind., wishes Partnership, o Situation with view to same in chemical manufacture, or any new venture with reasonable chance of success. 24 years' experience at home and abroad; knowledge engineering, electricity, and office management; languages, French and Portuguese; good organiser.—Box No. 9, CHEMICAL AGE Offices, 8, Bouverie St., E.C.4.

Situations Vacant.

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

WANTED.—BUSINESS MANAGER for branch of an American Manufacturer of Fine Chemicals to be established in London. Must have thorough experience and knowledge of British and Continental markets and should have a command of languages.—Address in confidence, giving age, experience, compensation expected, &c., to Box 10, CHEMICAL AGE, 8, Bouverie Street, E.C.4.